MAT 101.2 Reg. No. .....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

MATHEMATICS

PAPER I: CALCULUS AND NUMBER THEORY

Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A **3x10=30**

1. a) Given $f(x)=4x^3-9x$. Verify that the conditions of the hypothesis of Roll's theorem are satisfied in $\left[0 \quad 3/2\right]$ and find a suitable value of c satisfying $f'(c)=0$.

b) Find the relative extrema of the function $f(x)=3x^2-2x+1$ using the second derivative test.

c) Find the points of inflection of the graph of the function $f(x)=x^3+9x$. Also determine where the curve is concave upward and where it is concave downward.

d) Find the vertical and horizontal asymptotes of the graph of the function defined by $f(x)=\dfrac{2x+1}{x-3}$

e) Find $\lim\limits_{x\to\frac{\pi}{2}} \dfrac{\ln(\sin x)}{(\pi-2x)^2}$

f) Find the polar equation of a graph whose Cartesian equation is $x^2+y^2-4x=0$

g) Evaluate $\int_0^{\pi/2} \sin^5 x\,dx$

h) Find the value of χ for the function $f(x)=3-\dfrac{3x}{2}$ such that $\int_0^2 f(t)dt=f(\chi)(2-0)$.

i) Evaluate $\int \tan^3 x \sec^3 x\,dx$.

j) The region bounded by the curve $y=x^2$, the x axis and the line $x=2$ is revolved about the y axis. Find the volume of the solid generated. Take the elements of area parallel to the axis of revolution.

k) Find length of the arc of the curve $x=y^{3/2}$ from the point where y = 1 to the point where y = 4.

l) Find the area of the region enclosed by the graph of the equation $r=\theta$ from $\theta=0$ to $\theta=\dfrac{3}{2}\pi$.

m) Prove that the expression $\dfrac{a(a^2+2)}{3}$ is an integer for all $a\geq 1$.

n) If gcd (a, b) = d then prove that $\gcd\left(\dfrac{a}{d},\dfrac{b}{d}\right)=1$

o) Find whether $14x + 35y = 93$ has a solution or not.

PART - B

UNIT-I

2. a) If $f(x)$ exists for all values of x in the open interval *(a, b)* and if f has a relative extremum at c where $a < c < b$ and if $f'(c)$ exists, then prove that $f'(c) = 0$. **(6)**

b) Given $f(x) = x^4 + \frac{4}{3}x^3 - 4x^2$. Find the relative maxima and minima of f by applying the second derivative test. **(6)**

c) If the function f is differentiable on some open interval containing c, and if $(c, f(c))$ is a point of inflection of the graph of f, then if $f''(c)$ exists, prove that $f''(c) = 0$ **(6)**

3. a) Let c be a critical number of a function f at which $f'(c) = 0$ and let $f'(x)$ exist for all values of x in some open interval containing c. If $f''(c)$ exists, and if $f''(c) < 0$ then prove that f has a relative maximum value at c. **(6)**

b) State and prove Rolle's theorem. **(6)**

c) A cardboard box manufacturer wishes to make open boxes from pieces of cardboard 12 inch square by cutting equal squares from the four corners and turning up the sides. Find the length of the side of the square to be cut out to obtain a box of the largest possible volume. **(6)**

UNIT-II

4. a) Let f and g be functions that are differentiable on an open interval I, except possibly at the number a in I. Suppose that for all $x \neq a$ in I, $g'(x) \neq 0$. If $\lim_{x \to a} f(x) = 0$, $\lim_{x \to a} g(x) = 0$ *and* $\lim_{x \to a} \frac{f'(x)}{g'(x)} = L$, then prove that $\lim_{x \to a} \frac{f(x)}{g(x)} = L$ **(6)**

b) Find the third degree Taylor polynomial for the function $f(x) = x^{3/2}$ at $a = 4$. **(6)**

c) Sketch the graph of the function $y = 2x^3 - 6x + 1$. **(6)**

5. a) State and prove Cauchy's mean value theorem. **(6)**

b) Evaluate (i) $\lim_{x \to 0^+} (x+1)^{\cot x}$ (ii) $\lim_{x \to \frac{1}{2}^+} (2x-1) \tan \pi x$ **(6)**

c) Sketch the four leaved rose $r = 4\cos 2\theta$ **(6)**

UNIT-III

6. a) Establish a reduction formula for $\int x^m (\log x)^n dx$. Hence evaluate $\int_0^1 x^4 (\log x)^2 dx$. **(6)**

b) Find the approximate value of the definite integral $\int_0^2 \sqrt{1+x^4}\, dx$ using Trapezoidal rule by taking $n = 4$. **(6)**

c) Evaluate $\int x^5 \sqrt{x^2+4}\, dx$. **(6)**

7. a) Let the function f be continuous on the closed interval [a b] and let x be a number in [a, b]. If F is the function defined by $F(x)=\int_a^x f(t)dt$ then prove that $F'(x)=f(x)$. **(6)**

b) Find the exact value of the definite integral $\int_0^2 x^2dx$ as the limit of a Riemann sum with a regular partition of the interval [0, 2] and a suitable choice of ξ_i. **(6)**

c) Evaluate $\int \frac{dx}{x^2\sqrt{27x^2+6x-1}}$ by using the reciprocal substitution $x=\frac{1}{z}$ **(6)**

UNIT-IV

8. a) Find the volume of the solid generated by revolving about the x – axis, the region bounded by the parabola $y=x^2+1$ and the line $y=x+3$, using circular disc method. **(6)**

b) Find the length of the arc of the curve $x^{2/3}+y^{2/3}=a^{2/3}$ (a is a constant, $a>1$) in the first quadrant from the point where $x=\frac{1}{8}$ to the point where $x=1$. **(6)**

c) Find the area of the region bounded by the graph of $r=2+2\cos\theta$. **(6)**

9. a) The base of a solid is the region enclosed by a circle having a radius of r cms. Find the volume of the solid if all plane sections perpendicular to a fixed diameter of the base are squares. **(6)**

b) Find the length of the arc of the curve $8y=x^4+2x^{-2}$ from the point where x = 1 to the point where x = 2. **(6)**

c) Find the area of the region inside the circle $r=3\sin\theta$ and outside the limacon $r=2-\sin\theta$ **(6)**

UNIT-V

10. a) Find the gcd of 119 and 272. Express it in the form $119x+272y$ in two different ways. **(6)**

b) Prove that linear Diophantine equation $ax+by=c$ has a solution if and only if $d\,|\,c$ where $d=\gcd(a,b)$. If x_0, y_0 is any particular solution of the equation, then prove that all the other solutions are given by $x=x_0+\frac{b}{d}t$ and $y=y_0-\frac{a}{d}t$ where t is an arbitrary integer. **(6)**

c) A customer bought a dozen pieces of fruit, apples and oranges, for $1.32. If an apple costs 3 cents more than an orange and more apples than oranges were purchased, how many pieces of each kind were bought? **(6)**

P.T.O.

11. a) Given integers a and b with b > 0. Prove that there exist unique integers q and r such that $a = qb + r, \quad 0 \le r < b$ **(6)**

b) Given integers a and b not both of which are zeros. Prove that there exist integers x and y such that $\gcd(a, b) = ax + by$. **(6)**

c) If a cock in worth 5 coins, a hen 3 coins and three chicks together 1 coin, how many cocks, hens and chicks, totaling 100 can be bought for 100 coins? **(6)**

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CHE101.1 Reg. No. .....

CHOICE BASED CREDIT SYSTEM
FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020
CHEMISTRY
PAPER I: GENERAL CHEMISTRY

Duration: 3 hours **Max marks: 80**

PART A

1. Answer any TEN of the following: **10×2=20**

a) Mention the different types of chemicals based on the nature of the compounds. Give examples

b) What are agrochemicals? Give example.

c) How does the size of an atom vary along the period and down the group of periodic table?

d) Define ionization potential.

e) State the first law of thermodynamics. Give the mathematical expression.

f) Define heat capacity at constant pressure.

g) State Zeroth law of thermodynamics.

h) What is the Kelvin scale of temperature?

i) State Markownikoff's rule.

j) What is Inductive effect?

k) What is Diels Alder reaction? Give example.

l) What is the most stable conformation of cyclohexane? Why?

PART-B
UNIT-I

Answer any **TWO** of the following. **2×10=20**

2. a) Explain the significance of periodic classification in understanding the trends in the chemical properties of elements. **04**

b) Explain Born Haber cycle for the formation of an ionic bond. **03**

c) Define electron affinity. Why the electron affinity of fluorine is is less than that of chlorine? **03**

3. a) What are isoelectronic ions? Give two examples. **03**

b) Balance the equation by ion-electron method. $CrO_2^- + ClO^- \rightarrow Cl^- + CrO_4^{2-}$ in basic medium **04**

c) Define electronegativity. What are the factors influencing it? **03**

4. a) A positive ion is much smaller and a negative ion is bigger than a neutral parent atom. Why? **04**

b) What are the factors determining ionization energy? Why is the ionization energy of nitrogen greater than that of oxygen? **03**

c) How is the ionic radius determined by Lande's method? **03**

UNIT-II

Answer any **TWO** of the following. **2×10=20**

5. a) Explain Carnot's Cycle and derive an expression for its efficiency. **04**
   b) Derive the relationship between C_p and C_v. **03**
   c) Derive Kirchoff's equation. **03**

6. a) Show that Joule-Thomson effect is isoenthalpic. **04**
   b) The heat of a reaction for $N_2 + 3H_2 \rightarrow 2NH_3$ at 27°C was found to be $-91.94kJ$. Calculate the heat of a reaction at 50°C. The molar heat capacities at constant pressure at 27°C for nitrogen, hydrogen and ammonia are 28.45, 28.32 and 37.07 $JK^{-1}mol^{-1}$ respectively. **03**
   c) Derive an expression for Joule-Thomson coefficient. **03**

7. a) Derive an expression for entropy change for an ideal gas associated with temperature and volume change. **04**
   b) Derive an expression for work done by an ideal gas during reversible isothermal expansion. **03**
   c) Calculate the free energy change which occurs when one note of an ideal gas expands reversibly and isothermally at 300K from initial volume of 5 liters to 50 liters. **03**

UNIT-III

Answer any TWO of the following. **2×10=20**

8. a) Explain the mechanism of aldol condensation. **04**
   b) What is electromeric effect? Explain +E and – E effect with examples. **03**
   c) Give any two methods of preparation of 1, 3- butadiene. **03**

9. a) Explain the mechanism of chlorination of methane. **03**
   b) Explain the mechanism of Reimer-Tiemann reaction. **04**
   c) Explain the ring opening reaction of cycloalkanes. **03**

10. a) Explain the mechanism of Friedel-Crafts alkylation. **03**
    b) Explain the mechanism of addition of HBr to 1, 3 – butadiene. **03**
    c) Explain Bayer strain theory. What are its limitations? **04**

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PHY 101.2 REG. NO. .....

CREDIT BASED FIRST SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

PHYSICS

PAPER I: MATHEMATICAL PHYSICS, PROPERTIES OF MATEIALS AND RELATIVITY

Duration : 3 Hours **Max. Marks : 80**

PART – A

1. (a) Answer any TEN of the following: **10 X 1 = 10**

i. Write the expression for a position vector in Cartesian co-ordinate system.
ii. What do you meant by complex conjugate number?
iii. What is a second order differential equation?
iv. State Fourier's theorem.
v. Mention different types of stress.
vi. What is the unit of Poisson's ratio?
vii. Define molecular range.
viii. What is the effect of temperature on viscosity?
ix. What is the weight of a person who is inside a freely falling lift?
x. Define an non-inertial frame of reference.
xi. Write the Galilean transformation equation for position.
xii. Define proper time.

(b) Answer any FIVE of the following: **5 X 2 = 10**

i. Define dot product of two vectors and discuss the main characteristics of this product.
ii. Write the differential equation for radioactive decay and find its solution.
iii. What are angles of twist and angle of shear? Give the relation between the two.
iv. Distinguish between stream line and turbulent flow.
v. Give two differences between real and inertial forces.
vi. State the postulates of special theory of relativity.

PART – B

UNIT I

Answer any TEN of the following: **10 X 2 = 20**

2. a) Obtain expressions for radial and transverse velocity & accelerations of a particle.

b) $\vec{A} = 5t^2\hat{i} + t\hat{j} - t^3\hat{k}$ and $\vec{B} = \sin t\,\hat{i} - \cos t\,\hat{j}$, find

(i) $\frac{d}{dt}\left(\vec{A} + \vec{B}\right)$ (ii) $\frac{d}{dt}\left(\vec{A} \times \vec{B}\right)$ **(6+4)**

3. a) What is a second order differential equation? Give an example. Write the differential equation for the motion of pendulum and find its solution.

b) If (i) $\vec{Z}_1 = (6 - j2)$, $\vec{Z}_2 = (2 - j5)$ Subtract both analytically and using Argand diagram. **(6+4)**

4. a) Analyze a Square wave using Fourier's theorem and draw relevant graph.

   b) If a force $\vec{F} = -3\hat{i} + \hat{j} + 5\hat{k}$ acts at the point whose position vector is $\vec{r} = 7\hat{i} + 3\hat{j} + \hat{k}$, fine the magnitude of the force and Torque about the origin.

(6+4)

UNIT II

Answer any TEN of the following: **10 X 2 = 20**

5. a) What is a cantilever? Obtain an expression for the depression at the loaded end of a cantilever.

   b) A cube of aluminium of side 10 cm is subjected to a shearing force of 100 N. The top surface of the cube is displaced by 0.01 cm with respect to the bottom. Calculate the shearing stress, shearing strain and coefficient of rigidity. **(6+4)**

6. a). Give the theory of drop weight method of finding interfacial tension between two liquids.

   b) Calculate the work done in blowing a soap bubble from an initial surface area of $0.5 cm^2$ to a final surface area of 1.1 cm^2. Surface tension of soap bubble is 3×10^2 N m^{-1}. **(6+4)**

7. a) Obtain Stokes formula for viscous force acting on a body falling through a viscous medium.

   b) A metallic ball of radius 2 mm falls in a vertical column of castor oil. Find the terminal velocity. Given: Coefficient of viscosity of castor oil is 0.7 N s m^{-1} and density is 0.98×10^3 kg m^{-3}. Density of metal is 0.78×10^4kg m^{-3}. **(6+4)**

UNIT III

Answer any TEN of the following: **10 X 2 = 20**

8. a) Derive the equation of motion of a particle in a frame of reference moving with uniform acceleration relative to an inertial frame and hence obtain an expression for Pseudo force. Give one example of Pseudo force.

   b) Calculate the ficticious force and the observed force on a body of mass 5 kg in a frame of reference moving (i) vertical upwards (ii) vertically downwards, with an acceleration of 4 m s^{-2} , g = 9.8 m s^{-2}. **(6+4)**

9. a) Write Lorentz transformation equations and obtain an expression for time dilation.

   b) A spaceship which is 100m long on the ground appears to be 99 m long to a ground observer. What is its speed? **(6+4)**

10. a) Establish mathematically Einstein's mass-energy relationship.

   b) Find the velocity at which the mass of a particle is double its rest mass. **(6+4)**

MAT 201.2 Reg. No. .....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

MATHEMATICS

PAPER II: NUMBER THEORY AND DIFFERENTIAL EQUATIONS

Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A 3x10=30

1. a) Show that 41 divides $2^{20}-1$

b) If $P(x)=\sum_{k=0}^{m} C_k x^k$ is a polynomial function of x with integral coefficients C_k; and if $a \equiv b(\text{mod}\, n)$ then prove that $p(a) \equiv p(b)(\text{mod}\, n)$.

c) Solve $5x \equiv 2(\text{mod}\, 26)$

d) If p is prime then prove that $a^p \equiv a(\text{mod}\, p)$.

e) Find $\phi(1001)$

f) Find the sum of positive integers less than 100 and relatively prime to 100.

g) Find the rational number represented by [2; 3, 1, 4, 2]

h) For the Fibonacci sequence $\{u_n\}$, prove that $\gcd(u_n, u_{n+1})=1$ for every $n \geq 1$.

i) If x, y, z is a primitive Pythagorean triple, then prove that one of the integers x and y is even while the other is odd.

j) Solve $y' = 2x - y$

k) Solve $ydx+(x+x^2y^2)dy=0$

l) Check the exactness of $[2x+y\cos(xy)]dx+x\cos(xy)dy=0$

m) Find the general solution of $(x^2-1)p^2-2xyp+y^2-1=0$

n) Find the p-discriminant equation of $xp^2-2yp+4x=0$

o) Solve $x^2p^2-y^2=0$

PART - B

UNIT-I

2. a) Prove that the linear congruence $ax \equiv b(\text{mod}\, n)$ has a solution if and only if d | b where d = gcd (a, n). Also if d | b then prove that it has d mutually incongruent solutions modulo n. **(6)**

b) If $N = a_m \cdot 10^m + a_{m-1} \cdot 10^{m-1} + ... + a_1 \cdot 10 + a_0$ be the decimal expansion of the positive integer N, $0 \le a_k < 10$ and let $S = a_0 + a_1 + a_2 + ... + a_m$, then prove that $9 | N$ if and only if $9 | S$ **(6)**

c) Solve the simultaneous linear congruences,

$x \equiv 1 \,(\text{mod}\, 3)$
$x \equiv 2 \,(\text{mod}\, 5)$
$x \equiv 3 \,(\text{mod}\, 7)$ **(6)**

3. a) If $ca \equiv cb(\text{mod}\, n)$ then prove that $a \equiv b\left(\text{mod}\, \frac{n}{d}\right)$ where $d = \text{gcd}(c, n)$ **(6)**

b) Prove that every positive integer n > 1 can be expressed as a product of primes, and also prove that this representation is unique apart from the order in which factors occur. **(6)**

c) If p is a prime and if p | ab, then prove that p | a or p | b. **(6)**

UNIT-II

4. a) If p is a prime and p does not divide a then prove that $a^{p-1} \equiv 1 \,(\text{mod}\, p)$ **(9)**

b) Prove that the quadratic congruence $x^2 + 1 \equiv 0(\text{mod}\, p)$ where p is an odd prime, has a solution if and only if $p \equiv 1(\text{mod}\, 4)$. **(9)**

5. a) If n is a positive integer and gcd (a, n) = 1, then prove that $a^{\phi(n)} \equiv 1(\text{mod}\, n)$ where ϕ(n) is Euler's phi function. **(9)**

b) If p is prime then prove that $(p-1)! \equiv -1 \,(\text{mod}\, p)$ **(9)**

UNIT-III

6. a) Prove that the greatest common divisor of two Fibonacci numbers is again a Fibonacci number. Specially $\text{gcd}(u_m, u_n) = u_d$ where $d = \text{gcd}(m, n)$. **(6)**

b) Prove that k^{th} convergent of the simple continued fraction $[a_0; a_1, a_2, ..., a_n]$ has the value $C_k = \frac{p_k}{q_k}, 0 \le k \le n$ where $p_k = a_k p_{k-1} + p_{k-2}$ and $q_k = a_k q_{k-1} + q_{k-2}$ for $k \ge 2$. **(6)**

c) Prove that the area of a Pythagorean triangle can never be equal to a perfect (integral) square. **(6)**

7. a) If $m = qn + r$ then prove that $\gcd(u_m, u_n) = \gcd(u_r, u_n)$ **(6)**

b) Express $\frac{172}{51}$ as a finite simple continued fraction. **(6)**

c) Prove that the radius of inscribed circle of a Pythagorean triangle is always an integer. **(6)**

UNIT-IV

8. a) Solve $\left(y - \cos^2 x\right)dx + \cos x dy = 0$ **(6)**

b) Solve $\left(4xy + 3y^2 - x\right)dx + x(x + 2y)dy = 0$ **(6)**

c) Find the orthogonal trajectories of the family of curves given by $r = a\cos 2\theta$ **(6)**

9. a) Solve $2x^3 y' = y\left(y^2 + 3x^2\right)$ **(6)**

b) Solve $(2x + 3y - 1)dx + (2x + 3y + 2)dy = 0$ **(6)**

c) In a certain chemical reaction a substance is being converted into another substance such that the time rate of change of the amount x of unconverted substance is proportional to x itself. If half of the substance has been converted at the end of 10 seconds, find when nine tenths of the substance will have been converted. **(6)**

UNIT-V

10. a) Solve $xp^2 + (1 - x^2 y)p - xy = 0$ **(6)**

b) Find the general and singular solution of $xp^2 - 2yp + 4x = 0$ **(6)**

c) Solve $yy'' + (y')^2 + 1 = 0$ **(6)**

11. a) Solve $x^2 p^2 + xp - y^2 - y = 0$ **(6)**

b) Find the general and singular solutions of $p^2 + x^3 p - 2x^2 y = 0$ **(6)**

c) Solve $xy'' - (y')^3 - y' = 0$ **(6)**

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ZOO 201.2 Reg. No. .....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION ,OCTOBER 2020

ZOOLOGY

ZOOMORPHOLOGY - II

Duration: 3 hours **Max marks: 80**

Note: Answer any TEN Questions from Part-A
Answer SIX questions from Part-B choosing any two questions from each unit.

PART A

I. Answer any TEN of the following: **10x2=20**

1. Mention the coelomic cavities in Balanoglossus.
2. What are bony fish? Give two examples.
3. Give any two differences between Lampreys and Hagfish.
4. What is tunic? Mention its function.
5. Enumerate any two general characters of order Urodela. Give one example.
6. What is acoelous vertebra?
7. Name the living orders of class Reptilia.
8. What are Arcades and fossae?
9. What is pygostyle?
10. Write the generic name of i) Houses sparrow ii) Kingfisher
11. Explain the term Blubber.
12. Enumerate only 2 distinctive features of subclass Prototheria.

PART-B

UNIT-I

II. a) With a neat labeled diagram explain the external features of Scoliodon. 07

b) Draw a neat labeled diagram of Balanoglossus. 03

III. a) Describe the structure of ammocoete larva. Add a note on its metamorphosis. 07

b) Enumerate the general characters of subphylum Cephalochordata. 03

IV. a) With a neat labeled diagram explain the structure of Tornaria larva 05

b) Write the general characters of subphylum Urochordata. Give two examples. 05

UNIT-II

V. a) Explain the external features of *Haplobatrachus tigrinus*. 07

b) Write a note on first aid treatment for snake bike. 03

VI.	a)	Describe the poison apparatus. Add a note on its working mechanism.	07
	b)	Write a note on hyoid apparatus in frogs.	03
VII.	a)	Give the diagrammatic representation of the keys for the identification of the poisonous and non-poisonous snakes of India.	05
	b)	Write any ten general characters of class Amphibia.	05

UNIT-III

VIII.	a)	Write explanatory note on Palaeognathae.	07
	b)	Draw a neat labeled diagram of female reproductive system of rat.	03
IX.	a)	Write the general characters of order Chiroptera. Give two examples.	07
	b)	Write a short note on Marsupials.	03
X.	a)	Give an account of fossorial adaptations found in mammals.	05
	b)	Write a note on beak adaption in birds.	05

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CHE201.2 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SECOND SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
GENERAL CHEMISTRY-II

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any SEVEN of the following questions: **(7x2=14 Marks)**

1. Beryllium does not impart characteristic colour to the flame. Give reason.
2. Write two functions each of sodium and potassium in biosystems.
3. Write van't Hoff reaction isotherm equation and explain its terms.
4. What is green chemistry? Give two examples for green solvents.
5. What is percentage atom utilization? What is percentage atom economy?
6. Write any two applications of i) glycerol ii) ethanol
7. Cresols are weaker acids than phenols. Give reason.
8. Give two examples for naturally occuring phenols.

Section B

II. Answer any SIX of the following questions: **(6x6=36 Marks)**

9. a. How is Portland cement manufactured? (4)
   b. Explain the role of gypsum in the setting of cement. (2)
10. a. Compare the ionisation energy of alkali metals and alkaline earth metals. (3)
    b. Compare the atomic radii of alkali metals and alkaline earth metals. (3)
11. a. Write a note on stability of hydrides of alkali metals. (3)
    b. Write a note on wrap around complexes. (3)
12. a. Write three applications of Clausius-Clapeyron equation. (3)
    b. Calculate the heat of vapourization of water if the vapour pressure of water at 374 K and 372 K are 105 kPa and 99.5 kPa respectively. ($R = 8.314\ J\ K^{-1}\ mol^{-1}$). (3)
13. a. Explain the factors affecting the rate of reaction. (3)
    b. Decomposition of a gas is of second order. It takes 40 seconds for 40% of the gas to be decomposed, when its initial concentration is $4x10^{-2}$ mol/dm^3. Calculate the rate constant. (3)
14. a. Explain the mechanism for the Markovnikov's addition reaction of hydrogen chloride to propene. (4)
    b. What is anti-Markovnikov's rule? Write a reaction that obeys anti-Markovnikov's rule. (2)
15. a. Explain the aromatic electrophilic substitution reaction by nitration. (3)

b. Explain the mechanism of conversion of chlorobenzene to aniline. (3)

Section C

III. Answer any THREE of the following questions: (3x10=30 Marks)

16. a. Explain the manufacture of soda ash by Solvay's process. (5)
    b. Explain the manufacture of sodium hydroxide and chlorine. (5)

17. a. Explain with two examples how chemical kinetics is used in the determination of reaction mechanism. (5)
    b. Hydrolysis of ethyl acetate by NaOH using equal concentration of reactants was studied by titrating 20 ml of the reaction mixture at different time intervals against standard HCl. From the data given below show that this is a second order reaction. (5)

Time (mins)	0	5	15	25
volume of acid used(ml)	16.0	10.2	6.13	4.32

18. a. What is SN 1 reaction? Explain SN1 mechanism with an example. (5)
    b. What is E1 reaction? Explain E1 mechanism with an example. (5)

19. a. Explain the orientation effects of substituents with examples. (5)
    b. Explain Victor Meyer's test for distinguishing between primary, secondary and tertiary alcohols. (5)

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BOT 201.2 Reg. No. .....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION
SEPTEMBER 2020

BOTANY

Paper II: PLANT DIVERSITY – I

Time: 3 Hrs **Max. Marks: 80**

PART – A

1. Answer **any TEN** of the following: **10×2=20**
   a) What are raphae and girdles?
   b) What are pyrenoids? Where do they occur?
   c) What is a coenobium?
   d) What are cryptoblasts? Where do you find it?
   e) What is columella? Where do you find it?
   f) What is peristome? Where is it seen?
   g) What are vascular cryptograms?
   h) What is heterospory? Give an example.
   i) Name the spore bearning organs of *Ophioglossum* and *Osmunda*.
   j) What is a cast?
   k) Mention two types of canals found in *Equisetum*.
   l) Comment on the stele of *Marsilea* stem.

PART – B

UNIT – I

Answer **any TWO** of the following: **2×10=20**

2. a) Give an account of sexual reproduction of *Volvox* with suitable diagrams. **6**
   b) Explain the thallus structure of *Vaucheria* with a labeled diagram. **4**

3. a) Explain the sexual reproduction in *Spirogyra*. **6**
   b) Explain the internal structure of *Caulerpa* stolon with diagram. **4**

4. a) Explain the structure of carposporophyte and tetrasporophyte of *Polysiphonia* with suitable diagrams. **6**
   b) What is a diatomite? List any 3 uses of it. **4**

UNIT – II

Answer **any TWO** of the following: **2×10=20**

5. a) Write a note on Protostele with labeled diagrams. **6**
   b) List any 4 economic importance of Bryophyta. **4**

6. a) "*Anthoceros is a synthetic form*". Discuss. **6**
   b) Describe the structure of Antheridium of *Riccia.* **4**

7. a) With a neat labeled diagram, explain the synangium of *Psilotum.* **6**
   b) Write a note on moss flower. **4**

UNIT – III

Answer **any TWO** of the following: **2×10=20**

8. a) Give an account of geological time scale. **6**
   b) Explain the mature prothallus of *Pteris.* **4**

9. a) Write a note on i) Spike ii) Tassel iii) Sporocarp **6**
   b) Explain the sorus of *Hymenophyllum* **4**

10. a) Write a note on i) Types of Fossils
    ii) Fossil formation
    iii) Fossil fuels **6**
    b) Comment on the structure and morphological nature of *selaginella* rhizophore. **4**

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PHY 201.2 Reg. No. .....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020
PHYSICS
PAPER – II: MECHANICS AND THERMAL PHYSICS

Time: 3 Hrs. **Max. Marks: 80**

PART – A

I. A. Answer any TEN of the following: **10×1=10**

i. Define Moment of Inertia of a rigid body.
ii. Write the expression for Moment of Inertia of a fly wheel.
iii. Define centre of oscillation of a compound pendulum.
iv. Write the expression for acceleration due to gravity using Kater's pendulum.
v. Define linear momentum.
vi. Define conservative force field.
vii. Give an example for central force.
viii. What is the shape of the potential energy curve of a harmonic oscillator?
ix. Give the Clausius statement of the second law of thermodynamics.
x. Define entropy of a system.
xi. Give any two applications of low temperature physics.
xii. What do you mean by degradation of energy in the universe?

B. Answer any FIVE of the following: **5×2=10**

i) Derive the expression for rotational energy of a diatomic molecule.
ii) Show that the oscillations of a simple pendulum are simple harmonic when the amplitude is small.
iii) What are multistage rockets? What are its advantages?
iv) Show that the rate of change of angular momentum is equal to the applied torque.
v) Distinguish between reversible and irreversible process.
vi) Explain isotope effect of super conductors.

PART – B
UNIT – I

Answer any TWO of the following: **2×10=20**

2. a) State and prove the theorem of parallel and perpendicular axes of Moment of Inertia.
   b) A circular disc of mass 0.1kg and radius 0.1m rotates about its centre at 10 cycles per second. The axis of rotation is normal to the plane of the disc.

   Find (i) Moment of Inertia and (ii) Angular momentum. **(6+4)**

3. a) Derive an expression for moment of inertia of a rectangular lamina
   (i) about an axis at one of its sides and
   (ii) about an axis passing through it s centre and perpendicular to its plane.
   b) Calculate the moment of inertia of a rectangular plate of mass 500gm which is 0.1m long and 0.05 broad about an axis through (i) its centre and perpendicular to its plane and (ii) its centre parallel to its breadth. **(6+4)**

4. a) What is a simple pendulum? Derive an expression for the time period of a simple pendulum?
   b) The period of a bar pendulum is 1.53 s when the centre of suspension is 0.3m from one end and 1.49 s when it is 0.2m from the same end. If the bar is 1m long find acceleration due to gravity. **(6+4)**

UNIT – II

Answer any TWO of the following: **2×10=20**

5. a) Write expressions for the velocities of two particles of mass m_1 and m_2 after a head on collision between them and discuss the effect when (i) $m_1 = m_2$
   (ii) $m_1 \gg m_2$ (iii) $m_1 \ll m_2$
   b) An empty rocket weighs 5000kg containing 45,000kg fuel. If the exhaust velocity of the escaping gas is 2 km s^{-1}, calculate the maximum velocity attained. **(6+4)**

6. a) Derive an expression for the areal velocity in terms of angular momentum and show that when angular momentum is conserved, the motion of a particle is planar and transverse acceleration is zero.
   b) If the mass of a body is 5kg and position vector $\vec{r} = t^2\hat{i} + 2t\hat{j}$ at any instant t, find the magnitude and direction of the angular momentum about the origin at t = 2sec. **(6+4)**

7. a) Define central field. Derive an expression for the period of vertical oscillation of a light loaded spring using the law of conservation of energy.
   b) A vertical spring is stretched by 0.05m when load of 5kg is attached to it. What will be the period of oscillation when a load of 3kg is attached to it? **(6+4)**

UNIT – III

Answer any TWO of the following: **2×10=20**

8. a) Arrive at an expression for the entropy of a perfect gas.
   b) One mole of a perfect gas is expanded isothermally to twice its initial volume. Calculate the change in entropy. Given R = 8.313$JK^{-1}mol^{-1}$. **(6+4)**

9. a) Derive an expression for the work done by a gas during an isothermal and adiabatic expansion.
   b) Calculate the rise in temperature when a gas initially at 300 K is compressed adiabatically to 8 times its initial pressure. Given: $\gamma = 1.4$. **(6+4)**

10. a) What is superconductivity? Outline the experimental facts about this phenomenon.
    b) Find the depression in the melting point of ice for an increase in the external pressure by one atmosphere. Specific volume of ice at 0°C is $1.091 \times 10^{-3} m^3 kg^{-1}$ and that of water at 0°C is $10^{-3} m^3 kg^{-1}$. $L = 3.36 \times 10^5 Jkg^{-1}K^{-1}$.

    1 atmosphere $= 1.01 \times 10^5 Nm^{-2}$. **(6+4)**

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MAT 301.2 Reg. No. .....

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

MATHEMATICS

PAPER III: FUNCTIONS OF SEVERAL VARIABLES, MULTIPLE INTEGRALS AND GROUP THEORY

Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A 3x10=30

1. a) Find the domain of the function $z = \dfrac{\sqrt{x^2+y^2-25}}{y}$

b) If $u = \tan^{-1}\dfrac{y}{x}$, $x = \ln t$, $y = e^t$, find $\dfrac{du}{dt}$

c) If $f(x, y, z) = 3x^2 + xy - 2y^2 - yz + z^2$, find the rate of change of $f(x, y, z)$ at $(1, -2, -1)$ in the direction of the vector $2i - 2j - k$.

d) Find the volume of the solid bounded by the surface $f(x,y) = 4 - \dfrac{1}{9}x^2 - \dfrac{1}{16}y^2$ and the planes x = 3, y = 2 and the three co-ordinate planes.

e) Evaluate the iterated integral $\int_1^2 \int_0^{2x} xy^3 dy\, dx$

f) Evaluate $\iint_R \sin x dA$ where R is the region bounded by the lines $y = 2x$, $y = \dfrac{x}{2}$ and $x = \pi$

g) Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \int_0^{xz} \cos\dfrac{y}{z} dy\, dx\, dz$.

h) Evaluate the line integral $\int_C ydx + xdy$ where $C: \overline{R(t)} = t\hat{i} + t^2\hat{j}$, $0 \le t \le 1$

i) Evaluate $\int_0^{\pi} \int_2^4 \int_0^1 re^z dz\, dr\, d\theta$

j) Prove that intersection of two subgroups is a subgroup.

k) Find all the right cosets of the subgroup H = {1, −1} in the group G = {1, −1, i, −i} with respect to multiplication.

l) If $a = (1\ 3\ 5)(1\ 2)$ and $b = (1\ 5\ 7\ 9)$, find $a^{-1}ba$.

m) Prove that product of two normal subgroups is a normal subgroup.

n) If $\phi: G \to G'$ is defined by $\phi(x) = 2^x$ where G = (R, +) and $G' = (R - \{0\}, \cdot)$ prove that ϕ is a homomorphism of groups.

o) If $\phi: G \to \bar{G}$ is an isomorphism, then prove that $\ker\phi = \{e\}$

PART - B

UNIT-I

2. a) Using $\varepsilon - \delta$ definition, prove that $\lim_{(x,y)\to(1,1)} x^2 + y^2 = 2$ **(6)**

b) If $u = \ln\sqrt{x^2 + y^2}$, $x = re^s$, $y = re^{-s}$, find $\frac{\partial u}{\partial r}$ and $\frac{\partial u}{\partial s}$ using chain rule. **(6)**

c) Determine the relative extrema if any, for the function $f(x,y) = \frac{1}{x} - \frac{64}{y} + xy$ **(6)**

3. a) If $f(x,y) = \begin{cases} \frac{xy(x^2 - y^2)}{x^2 + y^2} & if\ (x,y) \neq (0,0) \\ 0 & if\ (x,y) = (0,0) \end{cases}$

prove that $f_1(0, y) = -y$ for every y

$f_2'(x, 0) = x$ for every x **(6)**

b) If $f(x,y) = e^x \sin y + \ln xy$, find $D_{11}f(x,y)$, $D_{12}f(x,y)$ and $\frac{\partial^3 f}{\partial x \partial^2 y}$ **(6)**

c) Find the equation of the tangent plane and normal line to the surface $x^2 + y^2 - 3z = 2$ at $(-2, -4, 6)$. **(6)**

UNIT-II

4. a) Find an approximate value of the double integral $\iint_R \left(x^2 y - 2xy^2\right) dA$, where R is the rectangular region having vertices P$(-3, -2)$ and Q$(1, 6)$. Take the partition of R formed by the lines $x_1 = -3$, $x_2 = -1$, $y_1 = -2$, $y_2 = 0$, $y_3 = 2$, $y_4 = 4$ **(6)**

b) Find by double integration, area of the region enclosed by one leaf of the rose $r = \sin 3\theta$ **(6)**

c) Find the area of the surface in the 1st octant cut from the cylinder $x^2 + y^2 = 9$ by the plane $x = z$. **(6)**

5. a) Find the volume of the solid in the 1st octant bounded by 2 cylinders $x^2 + y^2 = 4$ and $x^2 + z^2 = 4$. **(6)**

b) Find by double integration, area of the region inside the cardioid $r = a(1 + \cos\theta)$ and outside the circle $r = a$ **(6)**

c) Find the area of the surface cut from the planes $2x + y + z = 4$ by the planes $x = 0$, $x = 1$, $y = 0$, $y = 1$. **(6)**

UNIT-III

6. a) Find the volume of the solid bounded by the cylinder $x^2 + y^2 = 25$ and the plane $x + y + z = 8$ and xy plane, using triple integrals **(6)**

b) Evaluate $\int_c 4xy\,dx + \left(2x^3 - 3xy\right)dy$ where C consists of the line of the segment from $(-3, -2)$ to (1 0) and 1st quadrant arc of the circle $x^2 + y^2 = 1$ from (1, 0) to (0, 1) traversed in counter clockwise direction. **(6)**

c) Evaluate $\int_0^{\pi/4} \int_0^{a} \int_0^{r\cos\theta} r\sec^3\theta\,dz\,dr\,d\theta$ **(6)**

7. a) Evaluate $\iiint_S xy\sin yz\,dV$ where S is the rectangular parallelopiped bounded by the planes $x = \pi$, $y = \pi/2$ and $z = \pi/3$ **(6)**

b) Evaluate the line integral $\int_C \left(x^2 + xy\right)dx + \left(y^3 - xy\right)dy$ where C: the line y = x from the origin to the point (2, 2). **(6)**

c) Evaluate $\int_0^1 \int_0^x \int_0^{x+y} (x + y + z)\,dz\,dy\,dx$ **(6)**

UNIT-IV

8. a) State and prove Lagrange's theorem **(6)**

b) Express the permutation (1 2 3) (4 5) (1 6 7 8 9) (1 8) as a product of disjoint cycles. Find its order. Find whether it is odd or even. **(6)**

c) If H is a subgroup of a group G, prove that any 2 right cosets of H in G are either identical or disjoint.

9. a) Prove that S_n has as a normal subgroup of index 2, the alternating group A_n consisting of all even permutations. **(6)**

b) If G is a finite group, prove that $O(a) \mid O(G)$ and $a^{O(G)} = e$ **(6)**

c) If H and K are subgroups of a group G then prove that HK is a subgroup of G if and only if HK = KH **(6)**

UNIT-V

10. a) If G and $\overline{G}$ are groups and $\phi : G \to \overline{G}$ is a homomorphism, then prove that
(i) $\phi(e) = \overline{e}$, where e and $\overline{e}$ are identities in G and $\overline{G}$ respectively.
(ii) $\phi(x^{-1}) = \left(\phi(x)\right)^{-1} \forall\, x \varepsilon G$ **(6)**

b) Prove that a subgroup N of G is normal if every left coset of N in G is a right coset of in G. **(6)**

c) Prove that the set of all automorphisms of a group G is a group. **(6)**

P.T.O.

11. a) If $\phi: G \to \overline{G}$ is a homomorphism from G onto $\overline{G}$ and $\ker \phi = K$, prove that $\frac{G}{K}$ is isomorphic to $\overline{G}$ **(6)**

b) Define Automorphism of groups. Prove that $\phi: G \to G$ defined by $\phi(x) = gxg^{-1} \quad \forall\, x\, \varepsilon\, G$ is an automorphism. **(6)**

c) Prove that N is a normal subgroup of G if and only if $gNg^{-1} = N \quad \forall g\, \varepsilon\, G$. **(6)**

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CHE301.2 Reg. No. .....

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

CHEMISTRY

PAPER III: GENERAL CHEMISTRY

Duration: 3 hours **Max marks: 80**

PART A

1. Answer any TEN of the following: **10×2=20**

a) What is the oxidation state of oxygen in oxygen difluoride and of nitrogen in nitrous oxide.

b) Water has a higher boiling point than hydrogen sulphide. Give reason.

c) What are methanides? Give one example.

d) Write the structure of XeF_2 and mention the type of hybridization.

e) Define the term critical temperature and critical pressure.

f) Define viscosity and write its SI unit.

g) How many elements of symmetry are possible in a perfect cube?

h) State the law of rationality of indices.

i) How is 1,2- epoxy ethane synthesized from ethene.

j) Monochloro acetic acid is a stronger acid than acetic acid. Give reason.

k) What is Rosenmund reduction? Give an example.

l) What is cyclic ether? Give an example.

PART-B

UNIT-I

Answer any **TWO** of the following. **2×10=20**

2. a) What is inert pair effect? Explain its effect on oxidation states of group 13 elements. **04**

b) Write short notes on carbides. **03**

c) Explain the methods of preparation of $Xe0_3$ and XeF_4. **03**

3. a) Discuss the formation of hydrides in group -14 elements. **04**

b) Write a short note on clathrates. **03**

c) Explain banana bonding in diborane. **03**

4. a) Explain the general trends in the properties of oxides of group-15 elements. **04**

b) Give an example for PtF_6 complex of noble gases and mention its applications. **03**

c) Name any three types of silicates and give their structure. **03**

UNIT-II

Answer any **TWO** of the following. **2×10=20**

5. a) Explain the principles and determination of surface tension of a liquid by drop number method. **04**
   b) Write a note on classification of liquid crystals with one example for each . **03**
   c) Derive reduced equation of state for a real gas. **03**

6. a) Derive Bragg's equation of x-ray diffraction. **04**
   b) Determine the Miller indices of the crystal which cuts through the axes at $(2a, 3b, c)$ **03**
   c) Explain Andrew's isotherm of carbon dioxide. **03**

7. a) Derive the expression for critical constant T_c, V_c & P_C in terms of Van der Waals contant. **04**
   b) Write a short note on axis of symmetry. **03**
   c) Water requires 120.5 seconds to flow through a viscometer and the same volume of acetone requires 48.5 seconds. If the densities of water & acetone at 298K are $9.982 \times 10^2 kgm^{-3}$ and $7.92 \times 10^2 kgm^{-3}$ respectively and viscosity of water at 293K is 10.05 Pa.s Calculate the viscosity of acetone at 298K. **03**

UNIT-III

Answer any TWO of the following. **2×10=20**

8. a) Explain the mechanism of aldol condensation. **04**
   b) How do you prepare propanoic acid from Grignard reagent? **03**
   c) Explain the acid catalysed cleavage reactions of ethylene oxide **03**

9. a) How does acetaldehyde react with i) hydroxyl amine ii) phenyl hydrazine? **04**
   b) Explain Hoffmann's bromamide reaction with suitable example. **03**
   c) Write any three applications of crown ether. **03**

10. a) Explain the mechanism of Perkin's condensation. **04**
    b) Give two methods of preparation of dicarboxylic acid. **03**
    c) Explain the effect of substituents on the acidity of carboxylic acid. **03**

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PHY 301.1 Reg. No. .....

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020
PHYSICS
PAPER III: ACOUSTICS AND OPTICS

Duration : 3 Hours **Max. Marks: 80**

PART – A

1. (a) Answer any TEN of the following: **10 X 1 = 10**

i. What are free oscillations?
ii. When the resonance is said to be sharp?
iii. What is a longitudinal wave?
iv. What is the relation between the velocity of particle and the group velocity of wave?
v. When is interference said to be constructive?
vi. Why do we observe colours on soap bubbles?
vii. Give the expression for fringe width in the Young's double slit experiment.
viii. What is an interferometer?
ix. What is diffraction of light?
x. Write the formula for the width of the central maximum in the diffraction obtained using a single slit.
xi. State Malu's law of polarization.
xii. What is a Nicol prism?

(b) Answer any FIVE of the following: **5 X 2 = 10**

i. Mention the forces on which a damped mechanical system depends upon.
ii. State the laws of transverse vibrations of strings.
iii. Show that maximum intensity in interference pattern is four times the intensity due to each slit.
iv. Write the diagram of experimental set up to obtain Newton's rings.
v. Describe how a zone plate is constructed.
vi. State two differences between positive and negative crystal

PART – B
UNIT I

Answer any TEN of the following: **10 X 2 = 20**

2. a) What is simple harmonic motion? Give examples. Derive an expression for the displacement of simple harmonic oscillator.

b) A simple pendulum has a period of 1 s and amplitude of 10^0. After 10 complete oscillations its amplitude is reduced to 5^0. What is the relaxation time of the pendulum and quality factor? **(6+4)**

3. a) Assuming the expression for velocity of longitudinal waves in a fluid, deduce Newton's formula for the velocity of sound in air and apply Laplace's correction.

b) Find the temperature at which sound will travel in hydrogen with the same velocity as in helium at 100^0 C. Given density of helium is twice that of hydrogen. **(6+4)**

4. a) Discuss the longitudinal vibrations in a rod fixed at the centre and clamped at one of its end.

b) Calculate the fundamental frequency of sonometer wire of length 0.2 m. Given: Tension = 25 N, cross-sectional area = 10^{-2} cm^2 and density = 10^4 kg m^{-3}. **(6+4)**

UNIT II

Answer any TEN of the following: **10 X 2 = 20**

5. a) What is interference of light? Describe Young's double slit experiment to demonstrate the phenomenon of interference of light.

b) A biprism is placed at a distance of 5 cm in front of a narrow slit illuminated by sodium light and the distance between the virtual source is found to be 0.5 mm. Find the width of the fringes observed in an eyepiece placed at a distance of 0.75 m from the biprism. The wavelength of the light is 5890Å. **(6+4)**

6. a) Explain the interference due to a wedge shaped film and obtain expression for fringe width.

b) In a Newton's rings experiment the diameter of the 15^{th} ring was found to be 0.59 cm and that of the 5^{th} ring was 0.336 cm. If the radius of the Plano-convex lens is 100cm, calculate the wavelength of the light used. **(6+4)**

7. a) Explain with a ray diagram, the phenomenon of interference at a thin film due to reflected light.

b) In a Michelson interferometer 200 fringes cross the field of view when the movable mirror is displaced through 0.05896 mm. Calculate the wavelength of the monochromatic light used. **(6+4)**

UNIT III

Answer any TEN of the following: **10 X 2 = 20**

8. a) What is meant by half period elements? How is rectilinear propagation of light explained on the wave theory?

b) In Fraunhoffer's diffraction pattern due to a single slit, the screen is at a distance of 100 cm from the slit and the slit is illuminated by monochromatic light of wavelength 5893 Å. The width of the slit is 0.1 mm. Calculate the separation between the central maximum and the first secondary minimum. **(6+4)**

9. a) Distinguish between resolving power and dispersive power of an optical instrument. Deduce an expression for the dispersive power of a plane transmission grating.

b) Ice is a positive crystal with indices of refraction of 1.309 and 1.310. What should be the minimum thickness of ice so that it can act as a quartz wave plate for light of wavelength 6000 Å? **(6+4)**

10. a) Define specific rotation of a solution. With a neat diagram, describe how specific rotation of a solution is determined using a polarimeter.

b) Unpolarised light falls on a polarizing sheet placed on the top of another. What must be the angle between characteristic directions of the sheets if the intensity of transmitted light is one third of the intensity of incident beam? **(6+4)**

STA 301.1 Reg. No.....

CREDIT BASED THIRD SEMESTER B.Sc. DEGREE EXAMINATION SEPTEMBER 2020

STATISTICS

DISTRIBUTION & ESTIMATION THEORY

Duration: 3 Hours **Max Marks: 80**

PART –A

1. **Answer any TEN of the following:** **2x10=20**

   a) What is a standard normal variate? Write down its p.d.f.
   b) 'X' has uniform distribution over the range $(-\theta,\theta)$. Find its distribution function.
   c) Show that for Normal distribution with variance σ^2, all odd ordered moments about mean vanish.
   d) Define Cauchy distribution with parameter λ and μ.
   e) If Z is a S.N.V., write down the density function of Z^2.
   f) Find the distribution function of first order statistic.
   g) State the relation between S.N.V., χ^2 and Student's t variables.
   h) Write down the p.d.f. of Chi Square variate with n d.f.
   i) If T is unbiased for θ, show that $\sqrt{T}$ is biased for $\sqrt{\theta}$.
   j) Define sufficiency of an estimator.
   k) If $X_1, X_2, \ldots X_n$ is a random sample $U(0, \theta)$ find the moment estimator of θ.
   l) What is meant by interval estimation?

PART- B

Answer any TWO of the following: **10x2=20**

2. a) State and prove lack of memory property of Exponential distribution.

   b) Find median of Cauchy distribution with parameter θ. **(5+5)**

3. a) Obtain Mean Deviation from Mean of Normal distribution.

   b) Derive the expression for the central moments of a Normal distribution and hence show that the distribution is symmetric. **(5+5)**

4. a) Define Beta variate of first kind. Derive its mean and variance.

   b) State and prove additive property of Normal variates. **(5+5)**

Answer any TWO of the following: **10x2=20**

5. a) If X ~ Υ (m, n), Y ~ Υ (m, n) and X and Y are independent. Find the distribution of X/(X+Y) ? Identify the distribution.

   b) If χ_1^2 and χ_2^2 are independent Chi-Square variates with n_1 and n_2 d.f. respectively, find the distribution of χ_1^2 / χ_2^2. **(5+5)**

6. a) Derive the p.d.f. of t-variate with n.d.f.

   b) Derive the C.G.F. of χ^2 distribution. Using C.G.F. obtain β_1 and β_2. **(5+5)**

7. a) Derive the mean of F distribution.

   b) Stating the conditions establish the relationship between Chi square and F distribution. **(5+5)**

Answer any TWO of the following: **10x2=-20**

8. a) Prove that sample mean $\bar{x}$ is consistent for θ in N(θ, σ^2).

   b) Let x_1, x_2 be independent random sample from P(λ), show that $x_1 + x_2$ is sufficient for λ . **(5+5)**

9. a) Let x_1, x_2,.... x_n be a random sample from $f(x) = \frac{\theta^\alpha}{\Gamma\alpha} x^{\alpha-1} e^{-\theta x}, x > 0$ and α is known. Find the m.l.e. of θ.

   b) Find the moment estimators of θ_1 and θ_2 for the Uniform distribution $U(\theta_1, \theta_2)$. **(5+5)**

10. a) Derive the 100(1-α)% confidence interval for difference in means of two independent Normal populations with unknown but common variance.

    b) Derive 100(1-α)% confidence interval for the variance σ^2 of an independent Normal population with an unknown mean μ. **(5+5)**

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ZOO 401.2 Reg. No. .....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

ZOOLOGY

Histology, Animal Behaviour and Applied Zoology

Duration: 3 hours **Max marks: 80**

Note: Answer any TEN Questions from Part-A
Answer SIX questions from Part-B choosing any two questions from each unit.

PART A

I. Answer any TEN of the following: **10x2=20**

1. Mention any two functions of TSH.
2. Name the different histological layers of stomach.
3. Mention the parts of adrenal cortex.
4. What is hepatic triad?
5. Define habituation with an example.
6. What is innate behaviour? Give an example.
7. Mention the different types of individuals in a honey –bee colony.
8. What is catadromous migration? Give an example.
9. List any four exotic breeds of poultry.
10. What are draught breeds in dairy? Give one example.
11. List the materials which are used in Vermicomposting.
12. Mention any two characteristics of guppies.

PART-B

UNIT-I

II. a) Explain the hormones secreted by Pancreas. 07

b) Mention any three functions of growth hormones. 03

III. a) Describe the histology of ovary of a mammal. 07

b) List any three functions of spleen. 03

IV. a) Give an account of hormones of testis. 05

b) Draw a neat labelled diagram of T.S of kidney of a mammal. 05

UNIT-II

V. a) Write an essay on methods to study bird migration. 07

b) What is insight learning? Give an example. 03

VI.	a)	Explain the different types of nests in birds.	07
	b)	Write a note on territorial behaviour.	03
VII.	a)	Explain the types of taxes on the basis of orientation and movement.	05
	b)	Explain the social organisation in elephants.	05

UNIT-III

VIII.	a)	Explain the different stages of vermicomposting. Add a note on vermiwash.	07
	b)	What is gelatin? Write the uses of gelatin in food and non-food industries.	03
IX.	a)	Give an account of intensive method in poultry management.	07
	b)	Write a brief note on pearl culture.	03
X.	a)	Give an account of exotic breeds of cattle.	05
	b)	Explain the different types of poultry diseases.	05

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MIC 401.1 Reg. No. .....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

MICROBIOLOGY- IV

MICROBIAL PHYSIOLOGY AND METABOLISM

Duration: 3 Hours **Max Marks: 80**

Note: Draw diagrams wherever necessary.

PART A

I. Answer any TEN of the following: **10x2=20**

a) Biogeochemical Cycles
b) Fermentation
c) Grana
d) Chromatophores
e) Algal bloom
f) NAD
g) Green House effect
h) Proton Motive Force
i) Photosystems
j) Quinones
k) Bacteriorhodopsin
l) Acid Rain

PART-B

UNIT-I

Answer any TWO complete questions of the following: **2x10=20**

II. a) Explain the ETC. Add a note on its components. 06
b) Write a note on Heterolactic fermentation. 04

III. a) Explain the various modes of ATP generation in bacteria by substrate level phosphorylation and photophorylation. 06
b) Write a note on ED pathway. 04

IV. a) Explain Kreb's cycle. Add a note on its importance. 06
b) Write a note on Gluconeogenesis. 04

UNIT-II

Answer any TWO complete questions of the following: **2x10=20**

V. a) With a neat illustration explain the photosynthetic apparatus of Eukaryotes. 06
b) Explain the pathway of cyclic Photophosphorylation. 04

VI. a) Explain the Calvin Benson Cycle. 06
b) Give a comparative account of plant and bacterial Photosynthesis. 04

VII. a) Explain Non- Cyclic Photophosphorylation. 06
b) Write a note on Photosynthetic Pigments. 04

UNIT-III

Answer any TWO complete questions of the following: **2x10=20**

VIII. a) Explain the formation and development of Biofilms and a note on its significance. 06
b) Write a short note on oxidation of Ammonia and Nitrates. 04

IX. a) Explain the Nitrogen Cycle. 06
b) Write a note on Global Warming. 04

X. a) Explain Biocorrosion. Add a note on its detection. 06
b) Write a note on Phosphorus cycle. 04

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CHE 401.2 Reg. No. .....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

CHEMISTRY

PAPER IV: GENERAL CHEMISTRY

Duration: 3 hours **Max Marks: 80**

Note: 1. Write question numbers and subdivisions clearly.
2. Write chemical equations and diagrams wherever necessary.

PART A

1. Answer any TEN of the following: **10x2=20**

a) Sc^{+3} and Ti^{+4} ions are colourless. Why?

b) Fe^{+3} is more stable than Fe^{+2} Why?

c) What is the bond order of F_2 molecule?

d) Give any two limitations of Valence bond theory.

e) Write B.E.T. equation and explain the terms.

f) Mention the factors affecting adsorption of gases by solids.

g) State distribution law. What are its limitations.

h) What is an azeotropic mixture? Give an example.

i) Aniline is less basic than N – methyl aniline. Why?

j) How do you synthesize mitrobenzene from benzene diazonium chloride?

k) Explain addition polymerization with an example.

l) What is Vulcanization of rubber?

PART-B

UNIT-I

Answer any TWO of the following. **2x10=20**

2. a) Explain the properties of 3d transition elements with respect to colour and oxidation states. 04

b) Explain the structure and geometry of PF_5 03

c) Among $o_2^{2+}, o_2^{-}, o_2^{2-}$ which is paramagnetic? Why? Calculate bond order of each ion. 03

3. a) Draw the molecular orbital energy level diagram for nitrogen molecule and show the filling up of elections. Work the molecular orbital electronic configuration, Calculate bond order and explain magnetic property. 04

b) Calculate the magnetic moment of Cr^{3+} ion using spin only formula. 03

c) Give reason why transition metals form complex compounds readily? 03

4. a) Compare the 4d and 5d series of elements with their 3d analogues in respect of ionic radii, oxidation stakes, magnetic properties and stereo chemistry. 04

b) Based on VSEPR theory explain hybridisation and shape of H_2O molecule. 03

c) Draw the molecular orbital energy level diagram for He_2^{+} and show the filling

up of elections, write the molecular orbital electronic configuration and explain magnetic property. 03

UNIT-II

Answer any **TWO** of the following. **2x10=20**

5. a) Deduce Langmuir adsorption isotherm equation. 04
   b) Write a note on Nicotine – Water System. 03
   c) Nitrobenzene is steam distilled. The ratio of maasses of Nitrobenzene and water which distill over is 0.1888 at 97.42kpa pressure. If the vapour pressure of nitrobenzene is 2.56 kpa. Calculate the molecular mass of nitrobenzene 03

6. a) Distinguish between physical adsorption and chemical adsorption 04
   b) Explain boiling point – composition curves for liquid mixture showing large positive deviation and large negative deviation from Raoult's Law 03
   c) When benzoic acid was shaken with mixture of benzene and water of 298K and 101.3kpa, the following results were obtained. 03

Concentration of acid in benzene	0.24	0.55	0.93
Concentration of acid in water	0.015	0.022	0.029

   Show that benzoic acid is associated into double molecules in benzene layer. 03

7. a) Briefly explain any four applications of adsorption phenomenon. 04
   b) Explain the effect of impurities on consolute temperature. 03
   c) Explain the fractional distillation of non ideal solution of Type –I 03

UNIT-III

Answer any TWO of the following. **2x10=20**

8. a) How is Buna –S manufactured? Give two applications 04
   b) Explain Hoffmann method of separation of a mixture of primary, secondary and tertiary amines 03
   c) Explain the mechanism of anionic vinyl polymerization 03

9. a) Give any two methods of preporation of amines. 04
   b) Write the preparation and application of Bakelite 03
   c) What are synthetic polymers? How are they classified? Give one example for each. 03

10. a) What is the action of nitrous acid on primary, secondary and tertiary amines. 04
    b) Explain the mechanism of cationic vinyl polymerization. 03
    c) Explain how are the following prepared? 03
       i) Nylon 6,6 ii) Dacron

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PHY 401.2 Reg. No. .....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION SEPTEMBER 2020

PHYSICS

PAPER – IV: ELECTROMAGNETISM AND ELECTRICITY

Time: 3 Hrs. **Max. Marks: 80**

PART – A

I. A. Answer any TEN of the following: **10×1=10**

i. What is an irrotational field?
ii. What is Laplacian operator?
iii. State the Faraday's law of electro-magnetic induction.
iv. In normal dispersion, what happens to the refractive index if frequency of radiation increases?
v. State Norton's theorem.
vi. What is an ideal voltage source?
vii. Define half-time constant of a CR circuit.
viii. Why a pure inductance is a short for a steady current?
ix. Define half-power frequency.
x. Draw the circuit diagram for a CR high pass filter.
xi. Give the expression for line voltage in star configuration.
xii. Mention two applications of eddy currents.

B. Answer any FIVE of the following: **5×2=10**

i) Show that gradient of a scalar field is a vector.
ii) Distinguish between normal and anomalous dispersion.
iii) State and explain Kirchhoff's current law.
iv) Does the time constant of a circuit depend on the applied voltage? Explain.
v) What are the advantages of three-phase system over the single-phase system?
vi) Draw the labeled diagram for BG.

PART – B

UNIT - I

Answer any TWO of the following: **2×10=20**

2. a) Deduce Maxwell's field equation $\nabla . E = \frac{P}{\varepsilon}$ with usual symbols.
   b) Show that $\nabla r^n = nr^{n-2}\vec{r}$, where $\vec{r} = (x\hat{i} + y\hat{j} + z\hat{k})$. **(6+4)**

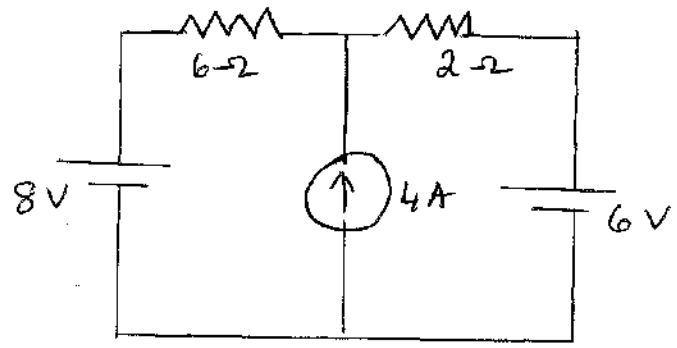
3. a) Prove the law of energy of electromagnetic wave using Pointing theorem.
   b) Prove that $\nabla . (\vec{A} + \vec{B}) = \nabla . \vec{A} + \nabla . \vec{B}$. **(6+4)**

4. a) Assuming the equation for velocity of electromagnetic wave in a medium, prove that light waves are electromagnetic in nature and hence derive Maxwell's relation $n = \sqrt{\mu_r \varepsilon_r}$.
   b) If the vector $\vec{A} = 3xyz\hat{i} + 2xy^2\hat{j} - x^2yz\hat{k}$ and scalar function $\phi = 3x^3yz$ evaluate $\text{div}(\phi\vec{A})$ at position $(1, -1, 1)$ **(6+4)**

UNIT – II

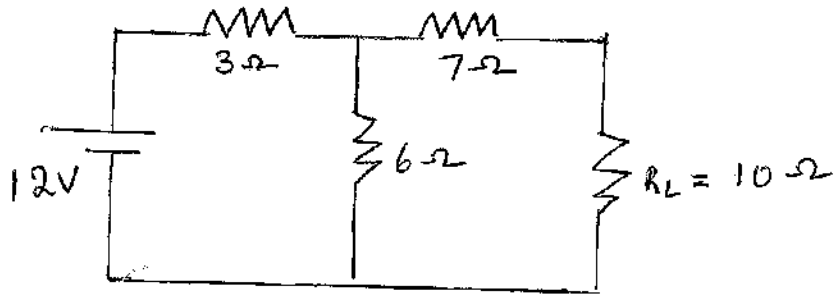
Answer any TWO of the following: **2×10=20**

5. a) With a general network explain the steps involved in finding the branch currents using nodal voltage method.
   b) Find the current through 6Ω resistor of the network using superposition theorem.



(6+4)

6. a) State and prove maximum power transfer theorem.
   b) Using Norton's theorem calculate the current flowing through R_L in the following.



(6+4)

7. a) Derive an expression for the decay of current in a LR circuit and define time constant.
   b) The charge on a capacitor of capacitance 1μF falls to 50% of its initial value in 5 minutes when the two plates of the capacitor are joined by an unknown resistance. What is the value of the resistance? **(6+4)**

UNIT – III

Answer any TWO of the following: **2×10=20**

8. a) Explain the terms peak value, mean value, r.m.s value and time period of ac. Derive the expressions for mean value and r.m.s value of alternating current.
   b) An AC source of 230V, 50Hz is applied to a circuit which contains an inductance of 0.2H and resistance of 120Ω in series. Calculate the impedance and current. **(6+4)**

9. a) Show that line voltage is $\sqrt{3}$ times the phase voltage in star configuration.
   b) Design a RC high pass filter for a cut off frequency 1kHz using a capacitor of 0.2μF. **(6+4)**

10. a) With the necessary theory explain the experiment to determine the charge sensitivity of a BG.
    b) 3 similar resistors are connected in star across 400V-3 phase supply. The line current is 5A. Calculate the value of each resistance. To what value should the line voltage be changed to obtain the same line current with the resistors connected in delta? **(6+4)**

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MAT 501.2 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION SEPTEMBER 2020

MATHEMATICS

PAPER V: SPECIAL FUNCTIONS & DIFFERENTIAL EQUATIONS

Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A **3x10=30**

1. a) Write the Fourier Series of an even function $f(x)$ with period 2π and write the formulae for the coefficients.

b) Evaluate $\beta\left(\frac{9}{2},\frac{7}{2}\right)$

c) Evaluate $\int_0^\infty e^{-t^2}\sqrt{t^3}\,dt$

d) Find complimentary function of the differential equation $\left(D^4+2D^2n^2+n^4\right)y=\cos mx$

e) Find the particular integral of the differential equation $(3D^2+D-14)y=13e^{2x}$

f) Solve $\left(D^2+2D+1\right)y=2e^{3x}$

g) Transform $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+2y=10x$ into a differential equation with constant coefficients by proper substitution.

h) Reduce $\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+x^2y=0$ to normal form.

i) Find A in the method of variation of parameter to solve $(D^2+1)y = \sec x$, if $y=A\cos x+B\sin x$.

j) Find $L\{\sin^2 kt\}$

k) Find Laplace transform of $\psi(t)=\begin{cases}4 & 0<t<1\\ 3 & t>1\end{cases}$

l) Find $L^{-1}\left\{\frac{15}{s^2+4s+13}\right\}$

m) A spring is such that it would be stretched 1.5 inches by a 2 pound weight. Find the spring constant.

n) Write the differential equation of motion when no force other than those of retarding force and the weight acting upon the spring.

o) Write one dimensional 1) wave equation 2) Heat equation

PART - B

UNIT-I

2. a) Obtain the Fourier series of the function with period 2π, given by $f(x)=\begin{cases}-k, -\pi<x<0\\ k, \ 0<x<\pi\end{cases}$ **(6)**

b) Evaluate $\int_0^1 x^3\left(1-x^2\right)^{5/2}dx$ **(6)**

c) Show that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$ **(6)**

3. a) Find the Fourier series of the function $f(x)=\begin{cases}O & -2<t<-1\\ k & -1<t<1.\\ O & 1<t<2\end{cases}$ $T=4$ **(6)**

b) Evaluate $\int_0^{\pi/2}\sin^{10}\theta\, d\theta$ using β function. **(6)**

c) Show that $\int_0^{\infty}\frac{x^4(1+x^5)}{(1+x)^{15}}dx=\frac{1}{5005}$ **(6)**

UNIT-II

4. a) Solve $(D^2-4D-5)y=e^{2x}+3\cos 4x.$ **(6)**

b) Solve $(D^2-13D+12)y=e^{-2x}+5e^{x}$ **(6)**

c) Solve $(D^2-1)y=2+5x$ **(6)**

5. a) Solve $(D^2-8D+9)y=8\sin 5x$ **(6)**

b) Solve $(D^2+5D+6)y=e^{-2x}+\sin 4x$ **(6)**

c) Solve $(D^2+3D+2)y=\sin x+x^2$ **(6)**

UNIT-III

6. a) Solve $x^3\frac{d^3y}{dx^3}+3x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=x+\log x$ **(6)**

b) Solve $\frac{d^2y}{dx^2}+\frac{dy}{dx}\tan x+y\cos^2 x=0$ by changing the independent variable. **(6)**

c) Solve by reduction of order method : $\left(D^2-3D+2\right)y=e^{x}$ **(6)**

7. a) Solve $x^2\frac{d^2y}{dx^2}+2x\frac{dy}{dx}=6x^2+2x+1$ **(6)**

b) Solve $4x^2\frac{d^2y}{dx^2}+4x^5\frac{dy}{dx}+\left(x^8+6x^4+4\right)y=0$ by reducing to normal form. **(6)**

c) Solve $\left(D^2+1\right)y=\sec x\tan x$ by variation of parameters. **(6)**

UNIT-IV

8. a) If F(t) has Laplace transform and if $F(t+w)=F(t)$, then prove that

$$L\{F(t)\}=\frac{1}{1-e^{-sw}}\int_D^w e^{-s\beta}F(\beta)d\beta$$ **(6)**

b) Solve $L^{-1}\left\{\frac{1}{(s^2+k^2)^2}\right\}$ **(6)**

c) Express $F(t)$ in terms of α function and find $L\{F(t)\}$ **(6)**

$$F(t)=\begin{cases}6 & 0<t<4\\ 2t+1 & t>4\end{cases}$$

9. a) Solve $x''(t)+4x'(t)+4x(t)=4e^{-2t},\ x(0)=-1,\ x'(0)=4$ **(6)**

b) Find $L^{-1}\left\{\frac{1}{s^2(s-1)}\right\}$. **(6)**

c) Find the transform of the function defined by

$$\psi(t,c)=\begin{cases}1 & o<t<c\\ 0 & c<t<2c\end{cases}\text{ and }\psi\left(t+2c,c\right)=\psi\left(t,c\right)$$ **(6)**

UNIT-IV

10. a) A spring is such a 4-pound weight stretches it 0.64 feet. The 4-pound weight is pushed up $\frac{1}{3}$ feet above the point of equilibrium and then started with a downward velocity of 5 feet per sec. The motion takes place in a medium which furnishes a damping force of magnitude $\frac{1}{4}|v|$ at all times. Find the equation describing the position of the weight at time t. **(9)**

b) Find the solution $u(x,y)$ of the equation $x^2u_{xy}+3y^2u=0$ **(9)**

P.T.O.

11. a) Solve the one dimensional heat equation. **(9)**

b) A spring is such that it would be stretched 6 inches by a 12 pound weight. Let the weight be attached to the spring and pulled down 4 inches below the equilibrium point. If the weight is started with an upward velocity 2 feet/sec. Describe the motion no damping or impressed force is present.

(9)

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MAT 502.1 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

MATHEMATICS

PAPER VI: DISCRETE MATHEMATICS

Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A **3x10=30**

1. a) Show that $2^n > n^3$ for $n \geq 10$ by induction.

b) If $A = \{p, q, r\}$ find $|P(A)|$ and write $P(A)$.

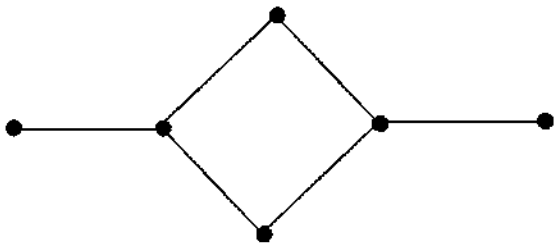
c) If no three diagonals of a convex decagon meet at a point, find the number of line segments into which the diagonals are divided by their intersection.

d) When are two graphs said to be isomorphic? Give an example.

e) Draw complete undirected graphs K_n for $n \leq 5$.

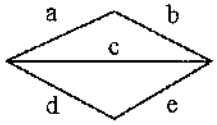
f) Prove that the sum of degrees of the vertices in a graph is always even.

g) Find the number of different spanning trees in the following graph.



h) Obtain a binary tree for the prefix code {1, 01, 0010, 000}

i) Given graph G:



list all fundamental cutsets with respect to the spanning tree $T = \{a, b, e\}$.

j) Find the output sequence produced by the finite state machine

State	Input		Output
	1	1	
A	B	C	0
B	C	D	0
C	D	E	0
D	E	B	0
E	B	C	1

for the sequence 1122.

k) Define tractable and intractable problem. Give an example of a tractable problem.

l) Define the following:

i) Equivalent states in a finite state machine

ii) Equivalent finite state machines iii) An accepting state

m) Obtain the numeric function corresponding to the generating function

$$A(z) = \frac{2}{1-4z^2}$$

n) Obtain the characteristic roots of the difference equation

$$4a_r - 20a_{r-1} + 17a_{r-2} - 4a_{r-3} = 0.$$

o) If $a = \alpha_0 + \alpha_1 r + \alpha_2 r^2 + ... + \alpha_n r^n$ show that a is $o(r^n)$.

PART - B

UNIT-I

2. a) If A, B, C are arbitrary sets, then show that (A – B) – C = (A – C) – B . **(6)**

b) Define phrase-structure grammar with example. **(6)**

c) Show that any integer composed of 3^n identical digits is divisible by 3^n. **(6)**

3. a) Prove that the set of all real numbers between 0 and 1 is not a countably infinite set. **(6)**

b) If the length of the longest chain in a partially ordered set $(P, \leq)$ is 'n', then show that the elements in P can be partitioned into n disjoint antichains. **(6)**

c) Find the number of integers between 1 and 250 that are divisible by any one of the integers 2, 3, 5 and 7. **(6)**

UNIT-II

4. a) Define the terms: Path, Circuit, Hamiltonian circuit. Illustrate with an example each. **(6)**

b) Prove that an undirected graph possesses an Eulerian path if and only if it is connected and has either zero or two vertices of odd degree. **(6)**

c) Prove that there is always a Hamiltonan path in a directed complete graph. **(6)**

5. a) In any connected plannar graph, with usual notations prove that $v - e + r = 2$ **(6)**

b) Let G be a graph with n vertices. If the sum of the degrees of each pair if vertices in G is $n-1$ or larger, then prove that there exists a Hamiltonian path in G. **(6)**

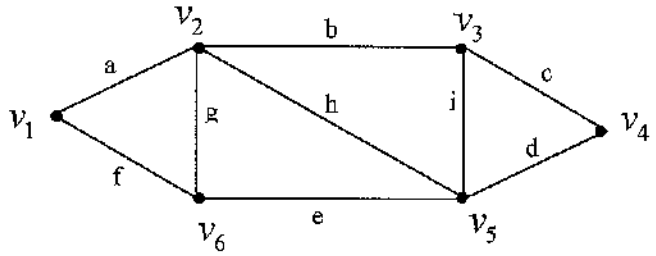
c) Show that a planar graph on n vertices can have at most $3n-6$ edges and, hence prove k_5 is non-planar. **(6)**

UNIT-III

6. a) Prove that a graph with $e = v - 1$ edges that has no circuits is a tree. **(6)**

b) Show that in a connected graph every circuit has an even number of edges in common with every cutset. **(6)**

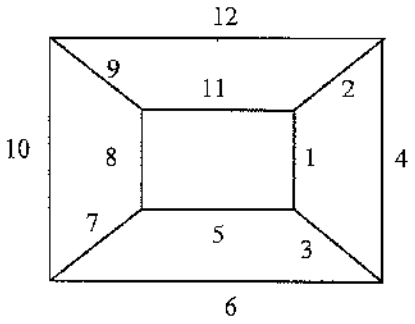
c) List all the fundamental circuits of the following graph with respect to the spanning tree $T = \{a, b, c, d, e\}$ **(6)**



7. a) In any connected graph G, with respect to a given spanning tree, let $D = \{e_1, e_2, e_3, ..., e_k\}$ be a fundamental cutset in which e_1 is a branch and $e_2, e_3, ..., e_k$ are chords. Show that
   (i) e_1 is contained in the fundamental circuits corresponding to e_i and $i = 2, 3, ... k$.
   (ii) e_1 is not contained in any other fundamental circuits. **(6)**

   b) Prove that the number of vertices is one more than the number of edges in a tree. **(6)**

   c) Define spanning tree, and obtain a minimum spanning tree for the weighted graph.



UNIT-IV

8. a) Show that the language $L = \{a^k b^k / k \geq 1\}$ is not a finite state language. **(9)**

   b) Write the algorithm 'LARGESTI' for determining the largest of n numbers. Also justify the correctness of the algorithm by a format proof. **(9)**

9. a) Show that the language $L\{a^k \mid k = i^2, i \geq 1\}$ is not a finite state language. **(9)**

   b) Write the algorithm BUBBLESORT for sorting n numbers stored in n registers. Also analyse its time complexity. **(9)**

UNIT-V

10. a) If $a_r = 3^r$, $r \geq 0$, $b_r = 2^r$, $r \geq 0$ and $c = a * b$. Show that $c_r = 3^{r+1} - 2^{r+1}$ **(6)**

    b) Find the particular solution of the difference equation $a_r - 4a_{r-1} + 4a_{r-2} = (r+1)2^r$ **(6)**

    c) Write the recurrence relation for the Fabonacci sequence of numbers and find its homogenous solution. **(6)**

11. a) Find the homogeneous solution for the difference equation **(6)**

$$a_r + 6a_{r-1} + 12a_{r-2} + 8a_{r-3} = 0$$

b) Find the particular solution for the difference equation **(6)**

$$a_r + a_{r-1} = 3r2^r$$

c) Determine the numeric function a_r, corresponding to the generating function

$$A(z) = \frac{2 + 3z - 6z^2}{1 - 2z}$$ **(6)**

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ZOO 501.2 Reg. No.....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION SEPTEMBER 2020
ZOOLOGY
Paper V: Cell Biology, Molecular Biology and Genetic Engineering

Duration: 3 Hrs. **Max. Marks: 80**

Note: Answer any **TEN** questions from **PART – A**
Answer **SIX** questions from **PART – B** choosing any two questions from each unit.

PART – A

1. Answer any TEN of the following: **10×2=20**

1) Define Karyotype. Mention its significance.
2) What are cell junctions? Mention the types of cell junctions.
3) Mention any two functions of lysosomes.
4) Write a note on cell differentiation.
5) What are mitotic inhibitors? Give two examples.
6) Name the subphases of prophase – I of meiosis.
7) What are anti-oxidants? Give two examples.
8) Write the functions of microfilaments.
9) What is Chargaff's Rule?
10) What are cloning vehicles? Give two examples.
11) What is gene library?
12) Name the initiation codon and termination codon of protein biosynthesis.

PART – B
UNIT – I

II. a) Explain the structural organization of eukaryotic chromosomes. **(07)**
b) Name any three subdivisions of Cell Biology giving definition for each. **(03)**

III. a) Give a detailed account on the chemical composition of plasma membrane. **(07)**
b) What are intermediate filaments? Mention their functions. **(03)**

IV. a) Describe "Balbiani rings" of ploytene chromosomes and "loops" of lampbnesh chromosomes. **(05)**
b) Describe the structural organization of microtubules. **(05)**

UNIT – II

V. a) What is Neoplasia? Explain the characteristics of cancer cells. **(07)**
b) Give any three differences between metaphase I and metaphase II of meiosis. **(03)**

VI. a) Give an account of mitosis in animal cell with suitable illustrations. **(07)**

b) Write note on biological carcinogens. **(03)**

VII. a) Write a short note on synaptonemal complex and synapsis. **(05)**

b) Explain nucleo-cytoplasmic interactions in Acetabularia. **(05)**

UNIT – III

VIII. a) Give a brief account of transcription and RNA processing. **(07)**

b) Write a note on DNA Polymerases. **(03)**

IX. a) With reference to genetic engineering describe isolation of DNA by Shot Gun Method. **(07)**

b) Why DNA replication is called semiconservative? **(03)**

X. a) Define genetic code. Write any four properties of genetic code. **(05)**

b) Explain PCR technique. **(05)**

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ZOO 502.2 Reg. No.....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020
ZOOLOGY
Paper VI: Developmental Biology

Duration: 3 Hrs. **Max. Marks: 80**

Note: Answer any **TEN** questions from **PART – A**
Answer **SIX** questions from **PART – B** choosing any two questions from each unit.

PART – A

1. Answer any TEN of the following: **10×2=20**

1) Explain the significance of Prostate gland.
2) What is acrosome? How is it formed?
3) Expand the term IVF and ET.
4) What is metagenesis. Give an example.
5) Define amphimixis.
6) What is a megalecithal egg? Give an example.
7) Name the parts of organizer.
8) What are primary germ layers? Name them.
9) What is primitive streak?
10) List the functions of amnion.
11) What is epitheliochorial placenta? Give an example.
12) What are identical twins?

PART – B
UNIT – I

II. a) With the help of a diagram explain spermatogenesis up to formation of spermatid. **(07)**
b) Write a note on Hermaphroditism with an example. **(03)**

III. a) Explain sperm bank and artificial insemination. **(07)**
b) Explain the theory of epegenisis. Give experimental evidence. **(03)**

IV. a) Explain Arrhenotoky and thelytoky with relavent examples. Add a note on significance of parthenogenesis. **(05)**
b) What are accessory sex organs? Explain with reference to human females. **(05)**

UNIT – II

V. a) With a labeled diagram, explain activation of ovum cortical reaction and formation of fertilization membrane. **(07)**
b) Explain the theories of organizer phenomenon. **(03)**

VI. a) "The amount of yolk and its distribution will determine the type of cleavage" – Elucidate. **(07)**

b) Draw and explain yolk plug stage of frog. **(03)**

VII. a) Explain notogenesis and neurulation in frog giving suitable illustration. **(05)**

b) Explain Fertilizer and Antifertilizer reaction. **(05)**

UNIT – III

VIII. a) Draw a labelled diagram of hen's egg and explain the structure. **(07)**

b) Draw a neat labeled diagram of 24 hours chick embryo. **(03)**

IX. a) What is placenta? Describe it on the basis of morphological structure giving illustrations and examples. **(07)**

b) Write explanatory notes on allantois. **(03)**

X. a) Discuss the role of hormones in development with reference to gonadotropins. **(05)**

b) Draw a neat labeled diagram of Graafian follicle. **(05)**

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MIC501.1 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION
OCTOBER 2020

MICROBIOLOGY

IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Duration: 3 Hours **Max Marks: 80**

Note: Draw diagrams wherever necessary.

PART - A

I. Answer any TEN of the following: **10X2=20**

a) Aspergillus
b) Lymphokines
c) Active Immunity
d) Penicillin
e) IgM
f) Hepatitis A
g) AZT
h) Tube Dilution Technique
i) Shigellosis
j) Cholera
k) Classify Hypersensitivity
l) Chemotherapy.

PART – B

UNIT – I

Answer any TWO complete questions from the following **2X10=20**

II. a) Explain the agglutination reactions. Add a note on its applications. 06
b) Write a note on the theories of immune response. 04

III. a) Explain the mechanisms of innate immunity. 06
b) Write a note on monoclonal antibodies. 04

IV. a) Define immunoglobulins. Discuss the structure of immunoglobulins. 06
b) Write a note on the factors determining immunogenicity of antigens. 04

UNIT-II

Answer any TWO complete questions from the following **2X10=20**

V. a) Explain the pathogenesis, lab diagnosis and treatment of *E.coli.* 06
b) Write a note on Trichomonas. 04

VI. a) Explain the pathogenesis, lab dignosis and treatment of Streptococcus. 06
b) Write a note on Hepatitis B Virus. 04

VII. a) Explain the pathogenesis, lab diagnosis and treatment of HIV. 06
b) Write a note on Candida. 04

UNIT-III

Answer any TWO complete questions from the following **2X10=20**

VIII.	a)	Discuss the Assay of Antibiotics by paper disc plate method.	06
	b)	Write a note on Gentamycin.	04
IX.	a)	Explain the principles of Chemotherapy. Add a note on the types of Chemotherapeutic Agents.	06
	b)	Write a note on Amphotericin – B.	04
X.	a)	Explain the production and mode of action of Streptomycin.	06
	b)	Write a note on factors affecting antimicrobial control.	04

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MIC 502.1 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION SEPTEMBER 2020

MICROBIOLOGY

ENVIRONMENTAL AND SOIL MICROBIOLOGY

Duration: 3 Hours **Max Marks: 80**

Note: Draw diagrams wherever necessary.

PART A

I. Answer any TEN of the following: **2x10=20**

a) Cess Pool

b) Citrus Canker

c) Anaerobic digester

d) Anderson Sampler

e) Rhizobium

f) Rubella

g) Disinfection

h) Super Bug

i) Atmospheric Water

j) Membrane Filter

k) Soil Actinomycetes

l) Moniliasis

PART-B

Answer any TWO complete questions from each unit

UNIT-I

II. a) Discuss briefly on the IMViC test. 06

b) Write a note on different types of water. 04

III. a) Explain the Trickling filter. 06

b) Write a note on the factors affecting microbes in stored water. 04

IV. a) Discuss about filtration for purification of drinking water. 06

b) Write a note on methanogenesis. 04

UNIT-II

V.	a)	Discuss the factors affecting microbes in Air.	06
	b)	Write a note on Histoplasmosis and Sporotrichosis.	04
VI.	a)	Discuss Pneumonia, Tuberculosis and Meningitis.	06
	b)	Write a note on Lemon Sampler.	04
VII.	a)	Discuss the significance of Microbes in Air.	06
	b)	Write a brief note on vertical cylinder spore trap.	04

UNIT-III

VIII.	a)	Discuss the role of secondary Metabolites in disease development.	06
	b)	Write a brief note on bioleaching with an example.	04
IX.	a)	Discuss the different types of Mycorrhizae.	06
	b)	Write a note on Tikka disease of groundnut.	04
X.	a)	Discuss the defense mechanism in plants.	06
	b)	Write a note on microbial insecticides.	04

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CHE 501.2 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

CHEMISTRY

PAPER V: GENERAL CHEMISTRY

Duration: 3 hours **Max marks: 80**

PART A

1. Answer any TEN of the following: **10×2=20**

a) Write Schrodinger wave equation for hydrogen atom and explain the terms.

b) Give de-Broglie equation.

c) Write the structure of chelate formed by EDTA with Zn^{+2}.

d) Give the IUPAC names of

i) $[PtCl_4(NH_3)_2]$ ii) $[Fe(H_2O)_6]SO_4$

e) Write Gibbs phase rule and explain the terms.

f) Explain Eutectic point with an example.

g) How does specific conductance and equivalent conductance vary with dilution?

h) Specific conductance of a deci normal solution of potassium chloride at 18°C is $1.12Sm^{-1}$. The resistance of a conductivity cell containing this solution at 18°C was 55 ohm. What is the cell constant?

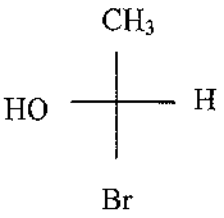
i) What are chiral molecules? Give an example.

j) What is Amadori rearrangement?

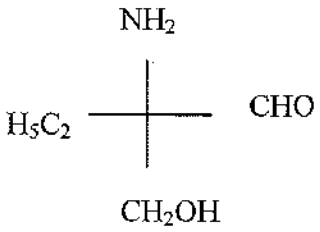
k) How does glucose react with Tollen's reagent?

l) Assign R/S configuration.

i)



ii)



PART-B

UNIT-I

Answer any TWO of the following. **2×10=20**

2. a) Explain Heisenberg's Uncertainity principle. **03**

b) Explain photo electric effect. **03**

c) Explain black body radiation. **04**

3. a) Explain ionisation isomerism with an example. **03**

b) What are the postulates of Quantum mechanics? **03**

c) What are ligands? Classify them with an example each. **04**

4. a) Explain optical isomerism in co-ordination compounds with an example. **03**

b) Explain with example. i) Hydrate isomerism ii) Ionisation isomerism **03**

c) Explain the structure of the complex $[Co(CN)_6]^{3-}$ using VBT. **04**

UNIT- II

Answer any TWO of the following. **2×10=20**

5. a) Explain why density of substance is bivariant. **03**

b) Discuss the phase diagram of lead-silver system. **04**

c) Write a note on freezing mixture. **03**

6. a) Write Debye-Huckle Onsager equation and explain the terms. Explain the verification of equation. **03**

b) Explain the phase diagram of water system. **03**

c) Discuss the conductometric titration curve for the titration of mixture of strong and weak acid vs strong base. **04**

7. a) State Kohlrausch's law and explain any one of its application. **03**

b) How is transport number of an ion determined by Hittorf's method using non attackable electrodes. **04**

c) The specific conductance of 0.01M solution of acetic acid was found to be 0.0163 Sm^{-1} at 25°C. Calculate degree of dissociation of the acid. Molar conductance of acetic acid at infinite dilution is $390.7\times10^{-4}Sm^2mol^{-1}$ at 25°C. **04**

UNIT-III

Answer any TWO of the following. **2×10=20**

8. a) What are glycosides? Give one method of preparation. **03**

b) Draw Newmann Projection formula and explain the conformations of 1, 2 dichloro ethane. **03**

c) Describe the chemical method for resolution of a racemic mixture. **04**

9. a) How is glucose converted to fructose? **03**

b) Explain optical isomerism in tartaric acid. **03**

c) With example, explain Kiliani-Fischer synthesis. **04**

10. a) Explain the structure of starch. **03**

b) Discuss the geometrical isomerism in cyclohexanes. **03**

c) How is the ring size of D (+) glucose determined. **04**

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CHE 502.2 Reg. No. .....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION OCTOBER 2020

CHEMISTRY

PAPER VI: GENERAL CHEMISTRY

Duration: 3 hours **Max marks: 80**

PART A

1. Answer any TEN of the following: **10×2=20**

a) What are lanthanides? Give their general electronic configuration.

b) Why is NaCl soluble in water but $BaSO_4$ is not?

c) Give two examples for borderline acids.

d) Which of the following reaction are feasible? and why?

$$Ag^+ + 2I^- \rightarrow [AgI_2]^-$$

$$Ag^+ + 2F^- \leftrightarrow [AgF_2]^-$$

e) Write Morse equation for potential energy of anharmonic oscillator. Explain the terms in it.

f) Which of the following is NMR active? Give reason.
H^1, C^{12}, C^{13}, N^{14}

g) What is mutual exclusion principle?

h) CO_2 does not give rotational spectra. Give reason.

i) What are reactive methylene compounds? Give an example.

j) How does formaldehyde react with Grignard reagent?

k) Give an example for azo dye and write its structure

l) How is anthraquinone converted to anthracene?

PART-B

UNIT-I

Answer any TWO of the following. **2×10=20**

2. a) Describe ion exchange method of separation of lanthanides. **04**

b) Explain the solubility of ionic solids on the basis of lattice energy and solvation energy. **03**

c) Explain the factors affecting hardness of the acids and bases? **03**

3. a) Explain how lattice energy of sodium chloride crystal is calculated using Born Haber cycle. **04**

b) Give any three similarities between actinides and lanthanides. **03**

c) What are hard acids and hard bases? Give their important characteristics? **03**

4. a) Discuss any four applications of HSAB principle. **04**

b) Explain the variation in oxidation states of actinides. **03**

c) Describe the conducting properties of the material using band theory. **03**

UNIT- II

Answer any TWO of the following. **2×10=20**

5. a) Derive an expression for moment of inertia of a diatomic molecule in terms of bond length and atomic masses. **04**
   b) Explain high resolution NMR spectrum of acidified ethanol. **03**
   c) Explain the formation of Stokes and anti Stokes lines in Raman spectra. **03**

6. a) In the IR spectrum of HBr, the absorption maximum was observed at $3.77\mu m$. Calculate the force constant of the bond. Given c = $3x10^8$ m/s, atomic mass of H=1.008 a.m.u and atomic mass of Br=79.9 a.m.u. **04**
   b) Give an example for standard reference in PMR spectroscopy. What are its advantages? **03**
   c) Explain applications of microwave spectroscopy. **03**

7. a) Derive an expression for rotational energy of a rigid rotator. **03**
   b) What is selection rule? Write and explain the selection rule for i) rotational transition ii) vibrational transition. **03**
   c) What is meant by nuclear shielding & deshielding in NMR spectroscopy? **04**

UNIT-III

Answer any TWO of the following. **2×10=20**

8. a) How is ethylacetoacetate prepared by claisen condensation method? Give its mechanism. **04**
   b) Explain Wagner – Meerwein rearrangement reaction. **03**
   c) Write the synthesis of Indigo. **04**

9. a) Give the salient features of molecular orbital theory of colour and constitution. **04**
   b) How is acetic acid obtained by Grignard reagent? **03**
   c) Explain how crotonic acid is prepared from ethylacetoacetate. **03**

10. a) Describe the classifications of dyes based on application. **04**
    b) How is barbituric acid prepared from diethyl malonate? **03**
    c) Explain Meervin-Pondorf-Verley reduction with an example. **03**

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PHY 501.1 Reg. No.....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION SEPTEMBER 2020

PHYSICS

PAPER V: SPECTROSCOPY AND QUANTUM PHYSICS

Duration: 3 Hours **Max Marks: 80**

PART –A

1. (a) Answer any TEN of the following. **10X1=10**

i) Which experiment confirms electron spin?

ii) What is gyro-magnetic ratio?

iii) What are the different kinds of molecular spectra?

iv) What is magnetic resonance?

v) What is a blackbody?

vi) What is Photoelectric effect?

vii) What are waye packets?

viii) What is an electron microscope?

ix) Write the eigen equation for a particle in a one dimensional box.

x) What is a harmonic oscillator?

xi) What is a free particle?

xii) What is the main difference between the energy levels of a rigid rotator and a harmonic oscillator?

(b) Answer any FIVE of the following. **5X2=10**

i) What is meant by Wave Number? Mention its unit.

ii) Mention the various factors responsible for the total energy of the diatomic molecule.

iii) Show that Planck's constant has the dimensions of angular momentum.

iv) State the laws of Photoelectric effect.

v) Show that the rest mass of a photon is zero.

vi) Give the physical significance of wave function.

PART-B

UNIT-I

Answer any TWO from the following: **2X10=20**

2. (a) Explain L -.S coupling and J -.J coupling for multi - electron system. Comment on the applications of spatial quantization.

(b) The experimental value of Bohr Magneton is 9.21×10^{-24} J T^{-1} and Planck's constant is 6.63×10^{-34} J s. Calculate the value of $\frac{e}{m}$ of an electron. **(6+4)**

3. (a) Describe Stern –Gerlach experiment and mention the results.

(b) Calculate the Zeeman shift in the normal Zeeman effect when spectral line of wavelength 600 nm is subjected to a magnetic field of 0.55 T.
Given: e $= 1.602 \times 10^{-19}$ C, m $= 9.1 \times 10^{-31}$ kg. **(6+4)**

4. (a) Obtain an expression for the rotational energy of a diatomic molecule and hence give the frequency and wave number of rotational spectra assuming it to be a rigid rotator.

   (b) Determine the value of rotational constant for the HF molecule. Given that the moment of inertia of the molecule is 1.38×10^{-47} kg m^2 , c = 3 X 10^8 ms^{-1}, h = 6.63 X 10^{-34} J.s **(6+4)**

UNIT-II

Answer any <u>TWO</u> of the following. **10x2=20**

5. (a) Discuss Planck's quantum hypothesis and hence deduce Planck's lLaw of energy distribution for black body radiation.

   (b) An aluminum foil of relative emittance 0.1 is placed in between two concentric spheres at temperature 300Kand 200K respectively. Calculate the temperature of the foil after the steady state is reached. Assume that the spheres are perfect black body radiators. Also calculate the rate of energy transfer between one of the spheres and the foil $\sigma = 5.672 \times 10^{-8}$ SI units. **(6+4)**

6. (a) With a neat diagram, explain the experiment of photoelectric effect and discuss the results.

   (b) The threshold frequency for photoelectric emission is copper is 1.1 X 10^{15} s^{-1}. Find the maximum energy of the photo-electros, when light of frequency 1.5 X 10^{15} s^{-1} falls on copper surface. Given that h = 6.63×10^{-34} J.s. **(6+4)**

7. (a) State Heisenberg's uncertainty principle and derive it from a hypothetical gamma ray microscope.

   (b) A microscope using photons is employed to locate an electron in an atom within a distance of 0.2×10^{-10} m. What is the uncertainty in the momentum of the electron located in this way? Given that h = 6.63 X 10^{-34} J.s, $m_0 = 9.1 \times 10^{-31}$ kg. **(6+4)**

UNIT-III

Answer any <u>TWO</u> of the following. **10x2=20**

8. (a) Obtain one-dimensional time independent Schrödinger wave equation from time-dependent Schrödinger wave equation.

   (b) The lowest energy possible for a certain particle entrapped in a box is 40 eV. What are the next three higher energies the particle can have? **(6+4)**

9. (a) Write down the Schrödinger wave equation for a free particle in a linear potential box and discus the curves of wave function and probability density.

   (b) A particle is moving in a one dimensional potential box of infinite height and width 1 nm. What is the probability of finding the particle in a small interval 0.1 nm at the centre of the box, when it is in its least energy state? **(6+4)**

10. (a) Set up Schrödinger wave equation for a free particle in a three dimensional rectangular box and obtain eigen functions and eigen values

    (b) Find the expectation value of the position of a particle trapped in a box of length 0.1nm. **(6+4)**

PHY 502.2 Reg. No.....

CREDIT BASED FIFTH SEMESTER B.Sc. DEGREE EXAMINATION SEPTEMBER 2020
PHYSICS
Paper VI: Solid State Physics

Duration: 3 Hrs. Max. Marks: 80

PART – A

1. a) **Answer any TEN of the following:** **10×1=10**
   i) What is the atomic heat of an element according to Dulong - Petit's law?
   ii) What are elastic waves?
   iii) Define drift velocity of electrons.
   iv) What is Fermi level?
   v) What is doping?
   vi) What is the application of Zener diode?
   vii) Under what condition does a LED emit light?
   viii) What is depletion region?
   ix) What are hard X-rays?
   x) What is Duan-Hunt law?
   xi) Name the two types of crystal defects.
   xii) What is anti ferromagnetism?

   b) **Answer any FIVE of the following:** **5×2=10**
   i) Compare F.D. and B.E. statistics.
   ii) Give any two applications of Hall effect.
   iii) What is an intrinsic semiconductor? Give example.
   iv) Give the expression for diode current.
   v) Draw a labeled diagram of a Coolidge tube.
   vi) What is diamagnetism? Why diamagnetic materials have negative susceptibility?

PART – B
UNIT – I

Answer any TWO of the following: **2×10=20**

2. a) Discuss Einstein's theory of specific heats of solids at low and high temperatures.
   b) The Debye temperature of carbon is 1850K. Calculate the specific heat per kilo mole for carbon at 20K. Also compute the highest lattice frequency involved in the Debye's theory.
   Given R = $8.31 \times 10^3 JK^{-1}Mol^{-1}$ **[6 + 4]**

3. a) Obtain the expression for electrical conductivity of metals on the basis of classical free electron theory.
   b) The resistivity of aluminium at room temperature is $2.62 \times 10^{-8}\Omega m$. Calculate the mobility of the conduction electrons in a field of $50Vm^{-1}$. Density of aluminium = 2700kg m^{-3}. **[6 + 4]**

4. a) Derive an expression for Hall Voltage.
   b) Calculate the Fermi energy of copper at T = 0K
   Given: Density of copper = $8.95 \times 10^3 kg\ m^{-3}$
   Atomic weight of copper = 63.54
   Planck's constant = 6.626×10^{-34} J s **[6 + 4]**

UNIT – II

Answer any TWO of the following: **2×10=20**

5. a) Explain the formation of bands in solids using the example of sodium.
   b) In an intrinsic semiconductor the energy gap is 1.2eV. What is the ratio between its conductivity at 600K and that at 300K. Given: $k = 1.38 \times 10^{-23} JK^{-1}$. **[6 + 4]**

6. a) Explain the variation of resistance of intrinsic semiconductor with temperature and obtain the expression for energy gap of the semiconductor.
   b) The conductivity of germanium at 20°C is 2 mho m^{-1}. What is its conductivily at 40°C? Given: Energy gap = 0.72eV, Boltzmann constant = $1.38 \times 10^{-23} JK^{-1}$. **[6 + 4]**

7. a) Explain static, dynamic forward and reverse bias resistances of a p – n diode using its V – I characteristics.
   b) The current flowing in a certain p – n junction diode at room temperature is 2×10^{-7} A when the large reverse voltage is applied. Calculate the current flowing when 0.1V forward bias is applied. **[6 + 4]**

UNIT – III

Answer any TWO of the following: **2×10=20**

8. a) Explain the origin of characteristics X – rays.
   b) An X – ray machine has an accelerating potential of 25,000V. Find the shortest wavelength present in the X – ray spectrum and also evaluate its frequency. **[6 + 4]**

9. a) State and arrive at Bragg's law for X – ray diffraction in crystals.
   b) The Bragg glancing angle is 35°22′ for second order maximum for monochromatic X – rays reflected from a crystal having inter planar distance 0.267nm. Calculate the wavelength of X – rays. Also calculate the highest reflecting order that could be observed with this radiation. **[6 + 4]**

10. a) Describe the Langevin's theory of para magnetism and obtain an expression for para magnetic susceptibility.
    b) A monochromatic X – ray beam of wavelength 0.07nm undergoes Bragg reflection from the plane (3,6,2) of a cubic crystal at a glancing angle of 39°7′11″. Calculate the lattice constant. **[6 + 4]**

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MAT 601.1 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2020

MATHEMATICS

PAPER VII: Partial Differential Equations, Vector Spaces and Series.

Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions from Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A **10×3=30**

1. a) Verify the condition of integrability for the equation $(2xz - yz)dx + (2yz - zx)dy - (x^2 - xy + y^2)dz = 0$.

b) Form a partial differential equation by eliminating a and b from $2z = (ax + y)^2 + b$.

c) Solve pq=k.

d) Define vector space.

e) If U and W are subspaces of V, prove that U+W is a subspace of V.

f) Prove that $\|\alpha u\| = |\alpha|\|u\| \quad \forall\, u \in V$ and $\alpha \epsilon F$.

g) Prove that if the linear transformation $T: V \to W$ is a one-one transformation of V onto W, then its inverse is linear.

h) Find the matrix which represents the linear transformation described by $(1,0,0) \to (1,2,1)$, $(0,1,0) \to (3,1,1)$ and $(0,0,1) \to (0,0,3)$.

i) Find an eigen vector of the matrix $A = \begin{pmatrix} 2 & 1 \\ 4 & 5 \end{pmatrix}$.

j) Determine whether the sequence $\left\{\frac{n^2+1}{n^2}\right\}$ is convergent or divergent.

k) Determine whether the infinite series $\sum_{n=1}^{\infty} \frac{3n+1}{2n^2+5}$ is convergent or divergent.

l) Test for the convergence of the series $\sum_{n=1}^{\infty} \frac{4}{3^n+1}$

m) Use the comparison test to determine if the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$ is convergent or divergent.

n) Prove that the series $\sum_{n=1}^{\infty} \left(\frac{-2}{3}\right)^n$ is absolutely convergent.

o) Use the root test to determine if the series $\sum_{n=1}^{\infty} (-1)^n \frac{3^{2n+1}}{n^{2n}}$ is convergent or divergent.

PART - B

UNIT-I

2. a) Assuming the condition of integrability solve $(yz + xyz)dx + (zx + xyz)dy + (xy + xyz)dz = 0$ **(6)**

b) Solve (y+z)p+(z+x)q=x+y by Lagrange's method. **(6)**

c) Solve p+q=x+y. **(6)**

3. a) Assuming the condition for integrability, solve $(yz + z^2)dx - xzdy + xydz = 0$. **(6)**

b) Solve $p(1 + q^2) = q(z - 1)$ **(6)**

c) Solve $\sqrt{p} + \sqrt{q} = 2x$ **(6)**

UNIT-II

4. a) If $\{v_1, v_2, \ldots, v_n\}$ is a basis of a vector space V over F and if $\{w_1, w_2, \ldots, w_m\}$ in V are linearly independent over F then prove that $m \leq n$. **(6)**

b) If V is the internal direct seem of subspaces $U_1, U_2, \ldots, U_n$ then prove that V is isomorphic to the external direct sum of $U_1, U_2, \ldots, U_n$ **(6)**

c) Define orthonormal set. If $\{v_i\}$ is an orthonormal set, then prove that the vectors in $\{v_i\}$ are linearly independent. **(6)**

5. a) V is a Vector space over F. If $v_1, v_2, \ldots, v_n$ are in V, then prove that either they are linearly independent or some v_k is a linear combination of its preceding vectors. **(6)**

b) If V is an inner product space over F, then for any $u, v \in V$, Prove that $|(u, v)| \leq ||u||\ ||v||$ **(6)**

c) If V is a finite dimensional vector space over a field F and W is a subspace of V then prove that W is finite dimensional and $\dim(W) \leq \dim(V)$ **(6)**

UNIT-III

6. a) Define linear Transformation. Prove that there is a one to one correspondence between the linear transformations $T: V_m(F) \to V_n(F)$and the m×n matrices with entries in the field F. **(6)**

b) Find the inverse of the matrix $\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$ using linear transformation. **(6)**

c) Prove that an isomorphism T of V onto W carries any set of independent vectors $\alpha_1, \alpha_2, \ldots, \alpha_n$ of V into independent vectors in W and any set $\beta_1, \beta_2, \ldots, \beta_n$ of vectors spanning V into vectors spanning W. **(6)**

7. a) Define Rank of a linear transformation. If $T: V \to W$ is any linear transformation, then prove that rank T +nullity T =dim V **(6)**

b) Find the inverse of $\begin{pmatrix} 1 & 0 & 3 \\ 2 & 4 & 1 \\ 1 & 3 & 0 \end{pmatrix}$ using linear transformation. **(6)**

c) Express the matrix $\begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$ as a product of elementary matrices. **(6)**

UNIT-IV

8. a) Using $\varepsilon - \delta$ definition of limit, prove that the sequence $\left\{\frac{2n^2}{5n^2+1}\right\}$ has limit $\frac{2}{5}$. **(6)**

b) Prove that a convergent monotonic sequence is bounded. **(6)**

c) Define infinite series. Given the infinite series $\sum_{n=1}^{\infty} U_n = \sum_{n=1}^{\infty} \frac{1}{n(n+1)}$

i) Find the first four terms of the sequence of partial sums $\{S_n\}$.

ii) Find a formula for S_n in terms of n. **(6)**

9. a) If the infinite series $\sum_{n=1}^{\infty} u_n$ is convergent, then prove that $\lim_{n \to \infty} u_n = 0$. Is the converse true? Justify your answer. **(5)**

b) Determine whether the infinite series. $\sum_{n=1}^{\infty} u_n = \sum_{n=1}^{\infty} \frac{5}{(3n+1)(3n-2)}$ is convergent or divergent. **(6)**

c) Prove that the sequence $\left\{\frac{1}{\sqrt{n^2+1}-n}\right\}$ is convergent. **(6)**

UNIT – V

10. a) Let $\sum_{n=1}^{\infty} u_n$ be a series of positive terms. If $\sum_{n=1}^{\infty} w_n$ is a series of positive terms that is known to be divergent and $u_n \geq w_n$ for all positive integers n, then prove that $\sum_{n=1}^{\infty} u_n$ is divergent. **(6)**

b) Determine whether the following series are convergent or divergent.
i) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+4n}}$ ii) $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$ **(6)**

c) Prove that the series $\sum_{n=1}^{\infty}(-1)^n \frac{(n+2)}{n(n+1)}$ is conditionally convergent. **(6)**

11. a) Show that the series $\sum_{n=1}^{\infty}(-1)^{n+1} a_n$, where $a_n > 0$ is convergent if $a_{n+1} < a_n$ and $\lim_{n \to \infty} a_n = 0$. **(6)**

b) Determine whether the series $\sum_{n=1}^{\infty} \frac{\cos\frac{n\pi}{3}}{n^2}$ is convergent or divergent. **(6)**

c) Use ratio test to determine whether the series $\sum_{n=1}^{\infty}(-1)^{n+1} \frac{n}{2^n}$ is convergent or divergent. **(6)**

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MAT 602.2 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2020

MATHEMATICS

PAPER VIII: Numerical Methods

Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions from Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

PART A **10×3=30**

1. a) i) Calculate the value of $\sqrt{102} - \sqrt{101}$ correct to four significant figures.
ii) Write the formula for the error in the product ab.

b) i) In which interval of unit length, the equation $x^3 - 2x - 5 = 0$ has a real root?
ii) What is the condition on $|\emptyset'(x)|$ in the method of iteration given by $x_{n+1} = \emptyset(x_n)$?

c) If $f(x)$ has a root with multiplicity 6, then what is the multiplicity of root of $f'(x) = 0$ *and* $f''(x) = 0$?

d) i) What is the degree of interpolating polynomial which interpolates 'n' distinct points?
ii) When is Lagrange's interpolation formula specially used?

e) Derive a formula for $\nabla^2 y_2$ in firms of y_0, y_1, y_2.

f) If $y = 3^x$ find $\Delta^2 y$ *with* $h = 1$.

g) Obtain a formula for divided difference $[x_0, x_1, x_2, x_3]$.

h) Write Simpson's $\frac{3}{8}^{th}$ rule to evaluate $\int_a^b f(x)dx$.

i) Write the formula for $\frac{dy}{dx}$ at $x = x_0$ obtained using Newton's Forward difference formula.

j) Find the row norm of the matrix $\begin{bmatrix} 5 & -2 & 4 \\ -2 & 1 & 3 \\ 1 & 0 & -1 \end{bmatrix}$

k) Find the rank of the matrix $\begin{bmatrix} 2 & 1 & 3 \\ 3 & 5 & -2 \\ 4 & 0 & 1 \end{bmatrix}$

l) i) Find whether the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ is orthogonal
ii) Which method is known as method of displacement?

m) For $y' = -y,\ y(0) = 1$ find $y(0.01)$ by Euler's method.

n) Obtain the first approximation in Picard's method to solve the differential equation $\frac{dy}{dx} = 1 + xy,\ y(0) = 1$.

o) Write Adam Bash forth predictor corrector formula.

PART - B

UNIT-I

2. a) Using the method of bisection find a real root of $x^3 - x - 1 = 0$ correct to 2 decimal places. **(6)**

   b) Using Newton-Raphson method obtain the real root correct to 3 decimal places of the equation, $x^3 - 2x - 5 = 0$ choose $x_0 = 2$. **(6)**

   c) Using iteration method find the real root of the equation $x^3 + x^2 - 1 = 0$ correct to 2 decimal places. Choose $x_0 = 0$. **(6)**

3. a) Describe the method of bisection. **(6)**

   b) Find the real root of the equation $f(x) = x^3 - 2x - 5 = 0$ using the method of false position correct to 2 decimal places. **(6)**

   c) Using the generalized Newton's formula find the double root of the equation $x^3 - x^2 -, x + 1 = 0$ (Choose $x_0 = 0.8$) **(6)**

UNIT-II

4. a) Derive Newton's forward difference formula to interpolate set of points $(x_0, y_0), (x_1, y_1), \ldots, (x_n, y_n)$. **(6)**

   b) From the following table of values of x and y determine f(0.23)

x	0.2	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

(6)

   c) Certain corresponding values of x and $log_{10}x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843), (307, 2.4871). Find $log_{10}(301)$ using Lagrange's interpolation formula. **(6)**

5. a) Find the value of tan (0.40) using Newton's Backward difference formula from the following data.

x	0.10	0.15	0.20	0.25	0.30
y=tanx	0.1003	0.1511	0.2027	0.2553	0.3093

(6)

   b) Find a cubic polynomial satisfying following data: **(6)**

x	0	1	2	3
y	1	2	1	10

   c) Using Lagrange's interpolation formula resolve into partial fractions $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ **(6)**

UNIT-III

6. a) Derive Simpson's $\frac{1}{3}^{rd}$ rule. **(6)**

   b) Using Newton's divided difference formula, find y when $x = 2$ using the following data. **(6)**

x	1	3	4	6
y	−3	9	30	132

c) Find $\frac{d^2y}{dx^2}$ at $x = 2.2$ for the following data. **(6)**

x	1	1.2	1.4	1.6	1.8	2	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

7. a) Using divided differences, derive Newton's general interpolation formula. **(6)**

b) The velocities of a car (running on a straight road) at intervals of two minutes are given below. Find the distance covered.

Time in minutes	0	2	4	6	8	10	12
Velocity in km/hr	0	22	30	27	18	7	0

(6)

c) From the following table, find x, correct to two decimal places, for which y is maximum. **(6)**

x	1.2	1.3	1.4	1.5	1.6
y	0.9320	0.9636	0.9855	0.9975	0.9996

UNIT-IV

8. a) Find the inverse of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ using Gauss-elimination method. **(9)**

b) Solve the following system of equations by Jacobi's method. Carry out 3 iterations.

$10x_1 - 2x_2 - x_3 - x_4 = 3$
$-2x_1 + 10x_2 - x_3 - x_4 = 15$
$-x_1 - x_2 + 10x_3 - 2x_4 = 27$
$-x_1 - x_2 - 2x_3 + 10x_4 = -9$

(9)

9. a) Describe Gauss-Scidel method to solve a system of linear equations. **(9)**

b) Find whether the following system is consistent.
$x - 4y + 5z = 8,\ 3x + 7y - z = 3,\ x + 15y - 11z = -14$ **(9)**

UNIT – V

10. a) Given $\frac{dy}{dx} - 1 = xy$ with $y(0 = 1)$ obtain Taylor series expansion for $y(x)$ and find $y(0.1)$ correct to 4 decimal places. **(6)**

b) Determine the value of y when $x = 0.1$ given $y(0) = 1, y' = x^2 + y$ using Euler's modified method. Take $h = 0.05$. **(6)**

c) Using Adam-Bashforth predictor corrector formula find $y(0.8)$ for $\frac{dy}{dx} = 1 + y^2$ where $y(0) = 0,\ y(0.2) = 0.2027,\ y(0.4) = 0.4228,\ y(0.6) = 0.6841.$ **(6)**

11. a) Using Euler method find $y(0.4)$ for the differential equation $y' = x + y$ given $y(0) = 0$. Take h=0.2 **(6)**

b) Given $\frac{dy}{dx} = y - x$, where $y(0) = 2$ find $y(0.1)$, when $h = 0.1$, correct to 4 decimal places, using Runge-Kutta 4th order formula. **(6)**

c) Derive Adams-Moulton corrector formula to solve $\frac{dy}{dx} = f(x, y)$ **(6)**

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MAT 602.3 Reg. No. .....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2020

MATHEMATICS

PAPER VIII: Graph Theory

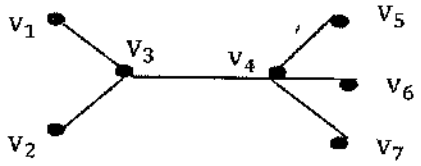
Duration: 3 hours **Max Marks: 120**

Note: 1. Answer any TEN questions from Part A. Each question carries 3 marks.
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

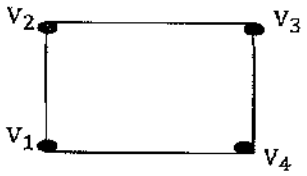
PART A **10×3=30**

1. a) Define 1) Hamiltonian circuit
2) Fundamental circuit in a connected graph G.

b) Find the center of the graph by finding eccentricity of each vertex in the following graph.



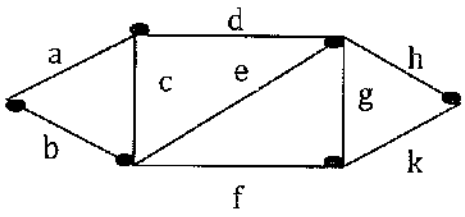
c) Define spanning tree and draw any two spanning trees of the following graph.



d) Define i) Planar graph
ii) Separable graph

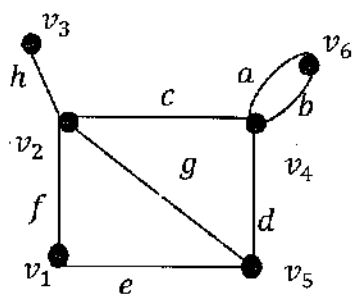
e) Prove that the vertex connectivity of any graph G can never exceed the edge connectivity of G.

f) List any two fundamental cutsets of the following graph with respect to the spanning tree $\{b, e, c, h, k\}$.



g) Define reduced incidence matrix and prove that the reduced incidence matrix of a tree is non singular.

h) Write the circuit matrix of the graph G given below.

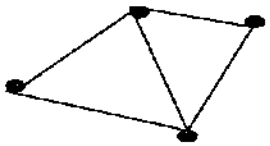


i) Draw the graph whose adjacency matrix is given below.

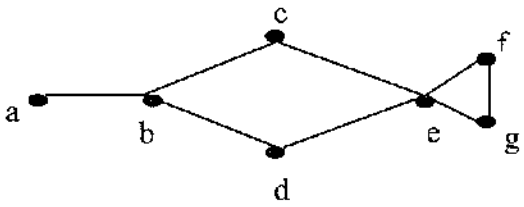
$$\begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{array} \begin{array}{c} \begin{array}{ccccc} v_1 & v_2 & v_3 & v_4 & v_5 \end{array} \\ \begin{pmatrix} 0 & 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 \end{pmatrix} \end{array}$$

j) Write the chromatic number of the following graphs.

k) Find the chromatic polynomial of the graph given below.

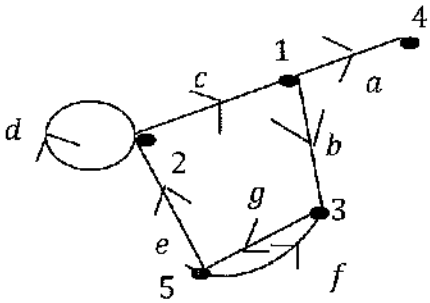


l) Write all the maximal sets of the following graph.



m) Define Euler digraph. Given one example of Euler digraph.

n) Write the adjacency matrix of the following diagraph.



o) For the given incidence matrix draw the diagraph.

$$A = \begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \end{array} \begin{array}{c} \begin{array}{ccc} a & b & c \end{array} \\ \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{pmatrix} \end{array}$$

PART - B

UNIT-I

2. a) Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges. **(6)**

b) Prove that a graph is a tree if and only if it is minimally connected. **(6)**

c) Define Spanning tree. Prove that a graph G is a tree if and only if there is one and only one path between every pair of vertices. **(6)**

3. a) Define distance between two vertices in a graph and show that distance between the vertices in a connected graph is a metric. **(6)**

b) Prove that a tree with n vertices has n – 1 edges. **(6)**

c) Prove that a connected graph G is an Euler graph if and only if it can be decomposed into circuits. **(6)**

UNIT-II

4. a) Prove that in a graph, every circuit has an even number of edges in common with any cutset. **(6)**

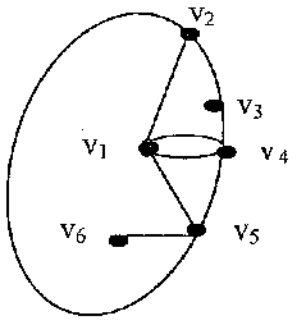
b) Define Vertex connectivity and Edge connectivity. Using Euler's formula prove that K_{33} is nonplanar. **(6)**

c) Prove that with respect to a given spanning tree T, a branch b_i that determines a fundamental cutset S is contained in every fundamental circuit associated with the chords in S and in no other. **(6)**

5. a) Prove that in a connected planar graph with n vertices and e edges there are $e - n + 2$ regions. **(6)**

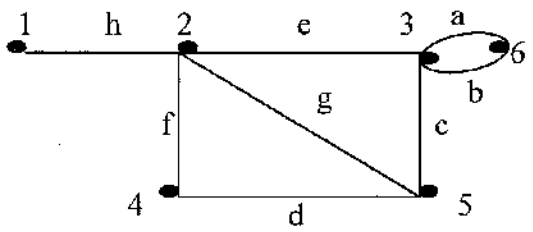
b) Prove that a graph can be embedded in the surface of a sphere if and only if it can be embedded in a plane. **(6)**

c) Draw the geometric dual of the following graph. **(6)**



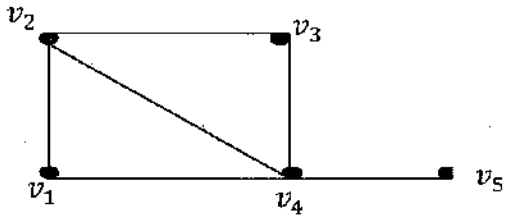
UNIT-III

6. a) Define 'incidence matrix' and write the incidence matrix of the following graph. **(6)**



b) If B is a circuit matrix of a connected graph G with n vertices and e edges, prove that the rank of $B = e - n + 1$. **(6)**

c) Define path matrix in a graph G and write the path matrix $P(v_2, v_5)$ of the following graph. **(6)**



7. a) If A(G) is the incidence matrix of a connected graph G with n vertices, then prove that rank of $A(G) = n - 1$. **(6)**

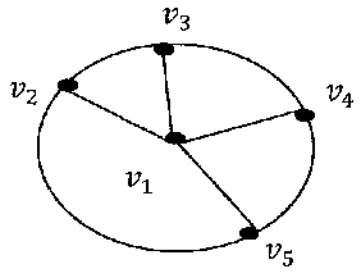
b) Let B and A be respectively the circuit matrix and the incidence matrix of a self-loop free graph whose columns are arranged in the same order of edges. Then prove that $AB^T \equiv BA^T \equiv 0(mod 2)$. **(6)**

c) Prove that the ring sum of two circuits in a graph G is either a circuit or an edge disjoint union of circuits. **(6)**

UNIT-IV

8. a) Prove that every tree with two or more vertices is 2-chromatic. **(6)**

b) Find the chromatic polynomial of the following graph. **(6)**



c) Prove that an n vertex graph is a tree if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$ **(6)**

9. a) Prove that a graph with at least one edge is 2-chromatic if and only if it has no circuits of odd length. **(6)**

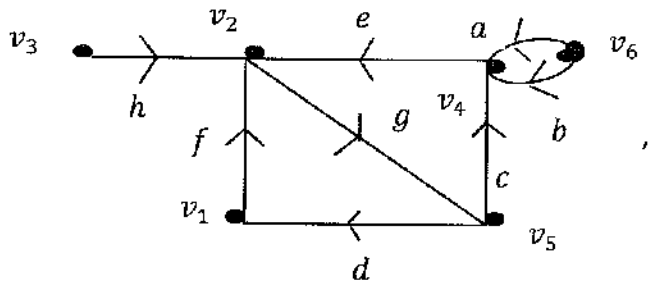
b) Prove that a graph on n vertices is a complete graph if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)(\lambda - 2) \ldots (\lambda - n + 1)$. **(6)**

c) Let a and b be two non adjacent vertices in a graph G. let G' be a graph obtained by adding an edge between a and b. Let G'' be the simple graph obtained from G by fusing the vertices a and b together and replacing sets of parallel edges with a single edge. Prove that $P_n(\lambda)\ of\ G = p_n(\lambda)\ of\ G' + P_{n-1}(\lambda) of\ G''$ **(6)**

UNIT – V

10. a) Prove that a digraph G is an Euler digraph if and only if G is connected and balanced. **(6)**

b) Write the incidence matrix of the following digraph. **(6)**



c) Let B and A respectively be the circuit matrix and the incidence matrix of a self loop free digraph such that the columns of B and A are arranged using the same order of edges. Then prove that every row of B is orthogonal to every row of A. **(6)**

11. a) If A is the incidence matrix of a digraph then prove that every square submatrix of A has determinant 1, −1 or 0. **(6)**

b) Prove that an arborescence is a tree in which every vertex other than the root has an indegree of exactly one. **(6)**

c) Let A_f be the reduced incidence matrix of a connected digraph. Then prove that the number of spanning trees in the graph equals the value of $det(A_f \cdot A_f^T)$. **(6)**

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ZOO601.2 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
ZOOLOGY THEORY VII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. Define phenocopy.
2. Give any 4 applications of ABO blood group.
3. Name the structural genes in the lac operon and mention their functions.
4. What are chorionic villi sampling?
5. Define gene flow & genetic drift.
6. What are vestigial organs? Give examples.

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. Give any 4 practical applications of genetics.
8. Explain complete linkage in Drosophila .
9. Write short note on the effect of environment on sex determination with an example.
10. Write short notes on i) Phenylketotonuria ii) Albinism
11. Explain natural selection with an example.
12. Explain the trends in the evolution of horse.

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. What is interaction of genes? Explain the phenomenon with reference to comb pattern in fowls.
14. Explain Pleiotropism with an example.
15. What is sex linked inheritance? Explain with reference to color blindness in humans.
16. Explain the mutations and genes linked to cancer.
17. Give a detailed account of the fossil history of Dinosaurs and Archaeopteryx.

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ZOO602.4 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
ZOOLOGY THEORY VIII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. Name two major zones of the lentic habitat.
2. What is secondary productivity?
3. Explain the term climax community.
4. List the ways by which carbon flows into the abiotic phase of the cycle.
5. List any four air pollutants
6. What are anthropogenic materials? Give an example.

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. Illustrate biome ecology with the help of a diagrammatic representation and explain.
8. Explain the term parasitism. Discuss the different forms of parasites.
9. Write notes on Allee's principle and Gause's principle.
10. With reference to threats to wildlife comment on : a)Over Harvesting b)Habitat Destruction
11. What is Acid Rain Explain its effects?
12. Discuss the various methods used to adulterate food.

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. Give an account of ecological classification of marine biota.
14. What are limiting factors? Explain 'Liebig's law of minimum' and 'Shelford's law of tolerance'.
15. With reference to landscape ecology, explain Landscape elements.
16. Discuss the sources and toxicity of Zootoxins and microbial toxins.
17. Explain the different methods of collecting primary data.

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MIC601.1 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020

MICROBIOLOGY THEORY VII

Food, Dairy & Industrial Microbiology

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. What is the role of sulphur dioxide and nitrates in food preservation?
2. What is Ergot?
3. List the Sources of microbial contamination of milk.
4. Expand UHT and mention the time and temperature used?
5. Define a Sparger.
6. Differentiate between Brewer's Yeast and Baker's Yeast.

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. Write a brief note on fermented foods.
8. Write a brief note on the standards and criteria used for food quality control.
9. Explain the dye reduction tests of milk.
10. Write a note on cheese making.
11. Define Crude media and explain in detail about C.S.L and S.W.L.
12. Define Stock Culture and explain about Strain development.

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. Give a detailed account of the contamination of plant products.
14. Describe microbiological examination of food by using microscopic techniques.
15. Write in detail about the microflora of milk.
16. Explain souring, gassy fermentation and stormy fermentation of milk.
17. Define Organic acids and Explain the Production of Vinegar in Industries.

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MIC602.5 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
MICROBIOLOGY THEORY VIII
Bacterial Genetics

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. Define translation.
2. What are structural genes?
3. Define the term Mutation.
4. Define Auxotrophs and Prototrophs.
5. What is pBR322? Mention its use.
6. Write any two safeguards of genetic engineering.

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. Explain the enzymes involved in DNA replication.
8. Explain the mechanism of generalised transduction.
9. Define mutation, mutants and write about mutation rate.
10. Define mutation, mutants and write about DNA repair.
11. Write a note on cloning strategy.
12. Write a note on Nif genes and super bug.

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. Explain in detail about the chemical components of DNA.
14. Explain the structure and biological significance of rRNA and tRNA.
15. Explain in detail the macrolesions produced in DNA.
16. Differentiate between mutations caused by agents that modify bases and agents that distort DNA.
17. Describe the role of biological scissors in genetic engineering.

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CHE601.2 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
CHEMISTRY THEORY VII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any SEVEN of the following questions: **(7x2=14 Marks)**

1. What are inert complexes? Give one example.
2. Calculate the spin only magnetic moment for Cr atom (z = 24).
3. Calculate the number of microstates for d^8 system.
4. Give the relation between standard electromotive force and equilibrium constant for a cell reaction and explain the terms.
5. KCl is employed in the preparation of salt bridge. Why?
6. Give the IUPAC names of the following:
   i) thiophene ii) pyrrole
7. Pyrrole is less basic than pyridine. Give reason.
8. How many NMR signals are obtained for i) ethyl alcohlol ii) ethyl bromide

Section B

II. Answer any SIX of the following questions: **(6x6=36 Marks)**

9. a. Give any two methods for the preparation of organolithium compounds. (3)
   b. Give any two methods for the preparation of organoaluminium compounds. (3)
10. Explain the applications of complexes in i) gravimetric analysis ii) volumetric analysis. (6)
11. a. Explain the determination of strength of Fe^{2+} ions in solution by potentiometric method. (3)
    b. The EMF of the following cell Hg $/Hg_2Cl_2$,KCl(sat) // H^+ /quinhydrone / Pt was found to be 0.228V at 25^0C. Calculate the pH of the solution.
    (Given E_{Cal} =0.2415V, $E^o_{(H^+, Q,QH2)}$ = +0.6996V). (3)
12. Explain the principle of i) nuclear reactor ii) solar photovoltaic cell. (6)
13. a. Thiophene undergoes electrophilic substitution at 2 and 5 positions. Explain. (4)
    b. Give any two electrophilic substitution reactions of thiophene. (2)
14. a. Give any two electrophilic substitution reactions of pyrrole. (2)
    b. Pyrrole undergoes electrophilic substitution at 2 and 5 positions. Explain. (4)
15. Explain the IR spectrum of the following: (6)
    i) benzaldehyde ii) ethanol

Section C

III. Answer any THREE of the following questions: (3x10=30 Marks)

16. Discuss crystal field splitting of d orbitals in case of the following. (10)
    i) octahedral complexes ii) tetrahedral complexes.

17. a. Explain the construction & working of calomel electrode. (5)
    b. i) Calculate the single electrode potential of zinc electrode formed by dipping a zinc rod in 0.02M $ZnSO_4$ solution at 298K ($E^0_{Zn^{2+},Zn}$) = - 0.76V
    ii) A silver rod is kept in contact with $AgNO_3$ solution of 0.1M. Calculate the single electrode potential of the eletrode. (standard reduction potential of Ag is +1.24V). (5)

18. a. Explain the photochemical formation of HCl(g) from hydrogen gas and chlorine gas and comment on the quantum yield. (5)
    b. For the photochemical reaction A $\rightarrow$ B. 1.0×10^{-5} moles of B were formed on absorption of 6.0×10^7 Joules at $3600A^0$. Calculate the quantum efficiency. Given $N=6.023 \times 10^{23}$, $h=6.626 \times 10^{-34}$ Joules sec, $C=3 \times 10^8$ m/sec. (5)

19. a. Explain: i) Bischler-Napieralski synthesis of isoquinoline ii) Skraup synthesis of quinoline. (8)
    b. What happens when quinoline is oxidised with alkaline potassium permanganate? (2)

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CHE602.2

Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION SEPTEMBER 2020
CHEMISTRY THEORY VIII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any SEVEN of the following questions: **(7x2=14 Marks)**

1. Show that citral is an α β unsaturated aldehyde.
2. Draw the structure of adenine and guanine.
3. Define the term drug. Give one example.
4. What is a prodrug? Give one example.
5. Give the synthesis of paracetamol.
6. With example explain Streckers method of amino acid synthesis.
7. Why is it necessary to protect the amino group of α amino acids in polypeptide synthesis?
8. What are essential elements? Give example.

Section B

II. Answer any SIX of the following questions: **(6x6=36 Marks)**

9. a. How would you prove that nicotine molecule has a pyrrolidine nucleus? (3)
   b. How would you show that pyrrolidine and pyridine nucleus are joined in nicotine at α position in the former and β position in the latter? (3)
10. a. How are terpenoids isolated by steam distillation process? (3)
    b. How are terpenoids classified? (3)
11. What is competitive enzyme inhibition? Illustrate with two examples.
12. Explain the working of kinase linked receptor with a diagram.
13. Explain the absorption and distribution phases of pharmacokinetics.
14. Write a note on globular proteins and fibrous proteins.
15. How is the structure of a protein determined?

P.T.O.

Section C

III. Answer any THREE of the following questions: (3x10=30 Marks)

16. a. Explain the general methods of determining the structure of alkaloids. (5)
    b. Explain the general characteristics of alkaloids. (5)

17. a. Discuss the constitution of coniine. (5)
    b. Give the synthesis of coniine and name its natural source. (5)

18. What is a biosensor? With a suitable example explain its working. Give its applications.

19. a. Explain the classification of amino acids with suitable examples. (7)
    b. What is protein denaturation? (3)

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CHE602.3 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
CHEMISTRY THEORY VIII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any SEVEN of the following questions: **(7x2=14 Marks)**

1. Round off the numbers to three significant figures i) 75.8437 ii) 59.873
2. What are the important requirements for a primary standard?
3. What is an oxidising agent? Give an example.
4. Noble metals exist in native state in the earth's crust. Give reason.
5. Sulphide ores are usually converted into oxides.Why?
6. How is dry milk obtained and what is its advantage?
7. What is the role of magnesium as a nutrient?
8. What are potash fertilizers?Give examples.

Section B

II. Answer any SIX of the following questions: **(6x6=36 Marks)**

9. a)What are the factors to be noted while selecting a sample for analysis (3)
   b) Explain the different steps for sample preparation. (3)
10. a) Explain the precautions to be taken during gravimetry by precipitation method. (3)
    b) Explain electrogravimetry. (3)
11. a) Explain leaching in metallurgy. (3)
    b) Explain hydrometallurgy with an example. (3)
12. a) Explain desilverisation of lead by Parke's process. (3)
    b) Explain extraction of gold from alluvial sand. (3)
13. a) Explain the production of formldehyde from petrochemical products. (3)
    b) Explain the production of acetone form petrochemical products. (3)
14. a) What are food preservatives? What are ClassI and class II preservatives ? Give one example for each. (3)
    b) What are sweeteners? Mention different types with examples. (3)
15. a) Define DO of water. Explain how is it determined. (3)
    b) Write a note on soil pollution. (3)

P.T.O.

Section C

III. Answer any THREE of the following questions: **(3x10=30 Marks)**

16. a. Explain the instrumentation of thin layer chromatography. (5)
    b. Explain ion-exchange chromatography. (5)

17. a) Explain extraction of iron using blast furnace. (5)
    b) Explain purification of lead by electrolytic method. (5)

18. a) Explain the method of preservation of meat. (5)
    b) Explain the method of preservation of vegetables. (5)

19. a) Explain primary and secondary processes of water treatment. (5)
    b) Explain tertiary process in water treatment. (5)

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BOT601.2 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION SEPTEMBER 2020
BOTANY THEORY VII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. Define Organogenesis? Mention its types.
2. Write any four applications of Callus culture.
3. State the importance of cybrids.
4. What is shot gun method ?
5. Write a note on Cow pea Trypsin Inhibitor Gene.
6. Define Red Biotechnology? Mention its significance.

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. What is Biotechnology? Mention its branches and explain its scope.
8. What is a nutrient medium? Explain inorganic nutrients and PGR's.
9. Write a note on: i)IED cells and PED cells ii) Encapsulation of embryo's.
10. Write a note on lambda phage vectors.
11. Explain i) Solid state Fermentation ii) Down stream Processing
12. Describe the fermentative production of Vit B12.

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. Explain the concept of cell theory and Totipotency. Add a note on aseptic culture of Datura anther.
14. Elaborate the process of Micropropagation with stem as an explant.
15. What are restriction enzymes? Explain its types.
16. Write a note on: i) *psy* gene ii) Golden rice 2 iii)Polyhydroxy butyrate iv)Biofertilizers
17. Briefly explain the biohazardous events observed in your atmosphere. Add a note on its biosafety measures.

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BOT602.5 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION SEPTEMBER 2020
BOTANY THEORY VIII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. List out the ecological group of plants depending upon their water relations.
2. What is an ecosystem ?
3. What is ecesis? Mention the type of processes.
4. Define primary and secondary succession.
5. What are non renewable energy resources? Give two examples.
6. What are endangered species ? Give an example.

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. What is soil water? Explain.
8. Write note on positive interactions of biotic factors.
9. Explain the upland deciduous vegetation and their types.
10. Write short notes on a) Scrub forest b) Deciduous forest
11. Write a note on polyculture and monoculture.
12. Write short notes on NEERI and UNEP.

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. Write the effects of Light and Wind on vegetation.
14. What are ecological pyramids? Explain each type in detail.
15. What is air pollution? Mention its causes, effects and control measures.
16. Write an explanatory note on vermicompost preparation.
17. Calculate the median for the data recorded on the weight of grain yield during 10 consecutive days which is presented below.
    Grain Weight in grams
    4.0 5.7 3.9 4.2 6.6 7.0 7.9 8.0 9.0 10.0

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PHY 601.1 Reg. No.....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION
SEPTEMBER 2020
PHYSICS
Paper VII: Electronics

Duration: 3 Hrs. Max. Marks: 80

PART – A

1. a) Answer any TEN of the following: **10×1=10**

i) Why emitter of a transistor is heavily doped?
ii) What is an operating point of a transistor?
iii) Define ripple factor.
iv) Why is a bridge rectifier so called?
v) What is an ac load line?
vi) Name the important parameters of an amplifier.
vii) What is meant by positive feedback?
viii) Give the block diagram of an oscillator.
ix) State DeMorgan's first theorem.
x) Why NAND gate is called a universal gate?
xi) What is a flip-flop?
xii) What is the need for modulation?

b) Answer any FIVE of the following: **5×2=10**

i) Briefly explain the working of n-p-n transistor.
ii) Describe the action of a capacitance filter.
iii) What are the characteristics of practical OPAMP-IC741?
iv) Explain the dc equivalent circuit of CE amplifier.
v) Explain the working of NOT gate using transistor.
vi) What is the principle of interlace scanning?

PART – B
UNIT – I

Answer any TWO of the following: **2×10=20**

2. a) Explain working of n-channel JFET. Draw the structural diagram.
b) Calculate the output dc voltage and efficiency for the bridge rectifier.
Given: $R_L = 100\Omega, r_f = 100\Omega,\ V = 300Sin314t.$ **[6 + 4]**

3. a) With a neat diagram, explain how a Zener diode can be used as a voltage regulator.
b) A 10V Zener diode is used to regulate voltage across a variable resistive load. The input unregulated voltage varies from 13V to 16V and load current varies between 10mA to 85mA, if $I_Z = 15mA$. Calculate maximum value of R_s and maximum power dissipated of Zener diode. **[6 + 4]**

4. a) Describe voltage divider biasing method for a transistor with suitable diagram and how stabilization of operating point is achieved.
b) i) Find the value of β if $\alpha = 0.9$
ii) Calculate I_E in a transistor for which $\beta = 50$ and $I_B = 20\mu A$ **[6 + 4]**

UNIT – II

Answer any TWO of the following: **2×10=20**

5. a) Obtain the expressions for input impedance, current gain, voltage gain, power gain, output impedance of a CE amplifier using r_e transistor model.
   b) For a transistor amplifier $R_1 = R_2 = 10k\Omega$, $R_c = 1k\Omega$, $R_E = 2k\Omega$ $V_{BE} = 0.7V$, $V_{cc} = 15V$, $R_L = 1k\Omega$ draw the dc load line, determine the operating point and draw the ac load line. **[6 + 4]**

6. a) What is meant by inverting amplifier? Derive expression for its voltage gain and mention the values of input and output resistances.
   b) Calculate the output voltage of a non-inverting amplifier for values $V_{in} = 2V, R_f = 500k\Omega$ and $R_1 = 100k\Omega$. **[6 + 4]**

7. a) With a neat circuit diagram, explain the working of a Wein-bridge oscillator using OPAMP.
   b) Determine the output voltage for both differential mode and common mode of an OP-AMP for input voltages of $v_{i1} = 150\mu V, v_{i2} = 140\mu V$. The amplifier has a differential gain of 4000 and the value of CMRR is 10^5. **[6 + 4]**

UNIT – III

Answer any TWO of the following: **2×10=20**

8. a) Construct OR, AND and NOT gates using NAND gates.
   b) Simplify the Boolean expression $Y = (AB + C)(AB + D)$. Draw the logic circuit for the reduced equation. **[6 + 4]**

9. a) With a neat diagram explain the working of a Decade Counter. Give its truth table and timing diagram.
   b) An amplitude-modulated wave has a power content of 800W at its carrier frequency. Determine the power content of each of the sidebands for 90% modulation. **[6 + 4]**

10. a) Derive an expression for the instantaneous voltage of an amplitude modulated wave and obtain the relation for the total power in terms of modulation index.
    b) A modulated carrier wave has maximum and minimum amplitudes of 750 mV and 250 mV. Calculate the value of percentage modulation. **[6 + 4]**

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PHY 602.3 Reg. No.....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION
SEPTEMBER 2020
PHYSICS
Paper VIII: Nuclear Physics

Duration: 3 Hrs. Max. Marks: 80

PART – A

1. a) **Answer any TEN of the following:** **10×1=10**

i) On what factor does the stability of a nucleus depend?
ii) What is packing fraction?
iii) Who proposed liquid drop model?
iv) Mention any two uses of nuclear reactors.
v) Define half life period of a radioactive substance.
vi) Give an example for artificial radioactive series.
vii) Write the unit of nuclear cross - section.
viii) What are transuranic elements?
ix) What is the main application of silicon diode detector?
x) What are cosmic rays?
xi) Give any property of neutrino.
xii) What are drift tubes?

b) **Answer any FIVE of the following:** **5×2=10**

i) What is mass defect? Explain.
ii) What is a moderator? What are its essential characteristics?
iii) Why Neptunium series is not found in nature?
iv) Give one example each for (d, α) and (d, p) reactions.
v) What are the applications of Betatron?
vi) What are Van - Allen belts? Explain briefly.

PART – B
UNIT – I

Answer any TWO of the following: **2×10=20**

2. a) Explain Yukawa's meson field theory and explain how the rest mass of a meson can be estimated using uncertainity principle?

b) Using Weizsacker formula, determine binding energy of $^{56}_{26}Fe$ and compare the result with experimental value.
Given: $a_v = 14.1MeV$, $a_s = 13.0Mev$, $a_c = 0.5951MeV$, $a_a = 19.0MeV$, $a_p = 33.5MeV$. Atomic mass of $^{56}_{26}Fe$ *is* $55.939395\ amu$. **[6 + 4]**

3. a) What is nuclear fusion? Give examples. With necessary equations explain p – p cycle and c – n cycle of nuclear fusion.

b) It is proposed to produce 100MW of electrical power on an average in a nuclear reactor having 20% efficiency, using U – 235. Calculate the amount of U – 235 required per day for continuous operation. Given energy released per fission of U – 235 is 200MeV. **[6 + 4]**

4. a) Write a note on properties and classification of neutrons.
   b) In a fusion reaction, power is produced as per the reaction $2^2{}_1He \rightarrow {}^4_2He + Q$. Assuming the efficiency of the process is 30%, find the mass of Deuterium to be consumed in a day for 15MW fusion reaction. **[6 + 4]**

UNIT – II

Answer any TWO of the following: **2×10=20**

5. a) Explain Rutherford's experiment on first artificial transmutation of elements.
   b) Calculate the threshold energy required to initiate the reaction ${}^{31}P(n,p)^{31}Si$. Given atomic masses ${}^1_1H = 1.00814\ amu$, ${}^1_0n = 1.00895\ amu$, ${}^{31}_{15}P = 30.98356\ amu$ and ${}^{31}_{14}Si = 30.98514\ amu$. **[6 + 4]**

6. a) With elements A, B and C forming a radioactive series, derive an expression for the number of atoms of B if at start B was not present in the sample.
   b) Thorium - 228 emits α – particles of energy 5.42 MeV. Calculate the disintegration energy. **[6 + 4]**

7. a) What is gamma ray emission? Write a note on the interaction of gamma rays with matter?
   b) A carbon specimen found in a cave contained $\frac{1}{8}$ as much C^{14} as an equal amount of carbon in living matter. Calculate the approximate age of the specimen. Half life period of C^{14} is 5568 years. **[6 + 4]**

UNIT – III

Answer any TWO of the following: **2×10=20**

8. a) Describe the theory and arrive at an expression for the final energy of the particle in a Cyclotron.
   b) Calculate the energy gained by the electron in a Betatron of the orbital radius 0.1m and magnetic field strength 1.5T. Also calculate the energy gained per revolution if the AC frequency of 50 Hz energizes the electromagnet of the Betatron. **[6 + 4]**

9. a) What are fundamental particles? Explain the classification of fundamental particles with respect to mass, spin and interaction.
   b) A cyclotron accelerate protons to 4MeV. To what energy will the cyclotron accelerate (a) Alpha particles and (b) Deuterons **[6 + 4]**

10. a) Describe with diagram the working of a GM counter and explain its characteristics. Comment on the quenching action of a GM tube.
    b) Protons are accelerated in a LINAC having 100 gaps with a potential difference of 1kV across each gap. Find the final energy of the protons. If the length of the first tube is 1m, what is the length of 50^{th} tube? **[6 + 4]**

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STA601 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
STATISTICS THEORY VII
Design of Experiments

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. What is the model for Two way ANOVA?
2. Give a t- statistic for pairwise testing of treatments in Two-way ANOVA.
3. Distinguish between blocks and treatments.
4. What do you mean by Missing Plot Technique?
5. Explain Factors and levels in an factorial experiment.
6. What is Partial confounding?

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. Split the total variation under Three way classified data and obtain the components.
8. Obtain expected sum of squares due to factor A under Two way Classified Data.
9. What do you mean by CRD? Give the model of the design and explain the components.
10. Derive an expression for expected value of sum of squares due to Errors in case of RBD.
11. Describe Yate's method of computing factorial effects totals in a 2^2 factorial experiment.
12. Explain how do you carry out the statistical anlaysis in case of complete confounding?

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. Derive the Expected sum of squares due to a factor A and Error in One way Classified data.
14. Derive the Expected sum of squares due to error in Three way Classified data.
15. Deduce the expected sum of squares due to error under LSD.
16. Justify that LSD is more efficient than CRD.

17. Explain 2^3 factorial experiment with an example and how do you obtain factorial effects totals using Yates method.

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STA602.2 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM
B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020
STATISTICS THEORY VIII
Statistical Quality Control

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any FIVE of the following questions: **(5x2=10 Marks)**

1. Mention any two objectives of SQC.
2. What is process capability?
3. Write the control limits of σ chart when the standards are known.
4. Give any two applications of c chart.
5. The expected sample size required to arrive at a decision about the lot is called as .....
6. What is the highest failure rate for a product if it is to have a probability of survival of 95% at 4000 hours? Assume that the time to failure follows an Exponential distribution.

Section B

II. Answer any FIVE of the following questions: **(5x6=30 Marks)**

7. Distinguish between product control and process control.
8. Explain the concept of rational subgroups.
9. When do you modify the control limits of $\bar{x}$ chart? Obtain the expression for modified limits of $\bar{x}$ chart.
10. Distinguish between control charts for variables and attributes.
11. Explain the five significant points in any OC curve.
12. Describe the life cycle of a complex product.

Section C

III. Answer any FOUR of the following questions: **(4x10=40 Marks)**

13. Define Statistical Quality Control.Briefly explain the two causes of variation.
14. Explain the concept of control charts.
15. How do you deal with the problem of varying subgroup size in p-chart.

16. Stating the assumptions construct SSP for variables when lower specification limit is given and σ is known and also when σ is unknown.

17. Explain the concept and distribution of SSP by attributes.

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COS601.2 Reg. No : .....

CREDIT BASED SEMESTER SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020

COMPUTER SCIENCE THEORY VII

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any SEVEN of the following questions: **(7x2=14 Marks)**

1. What is the role of compilation model?
2. Define view state.
3. What is the use of hyperlink server control?
4. Mention any two public properties SiteMapPath Control.
5. List any four validation controls.
6. Explain any two properties of CompareValidator Control.
7. Define Importcatalogpart.
8. Mention any two properties of a Data Display Control.

Section B

II. Answer any SIX of the following questions: **(6x6=36 Marks)**

9. Explain any six inbuilt directories for web applications.
10. Explain ASP.NET page events.
11. Differentiate between i)CollapseImageToolTip and CollapseImageUrl ii)TreeNodeCheckChanged and TreeNodeCollapsed .
12. What is the use of PasswordRecovery Control? Explain .
13. How can themes be applied on controls at Runtime? Explain.
14. Explain the different Data Source Controls.
15. Explain the steps involved in accesssing data with Server Explorer.

Section C

III. Answer any THREE of the following questions: **(3x10=30 Marks)**

16. Explain the history and benefits of ASP.NET.
17. a)How do you work with server controls on a design surface . b)Write a note on Intellisense feature of coding server control .
18. a)List any three date formats to output from calendar control. b)Explain the following elements with respect to AdRotator control i)Alternate text ii)Impressions iii)keyword iv)ImageUrl v)NavigateUrl.
19. a)Explain Disconnected Data Architecture in .NET framework. b)How do you access data using ADO.NET? Explain.

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COS602.3

Reg. No : .....

CREDIT BASED SEMESTER SYSTEM

B.Sc. SIXTH SEMESTER DEGREE EXAMINATION, SEPTEMBER 2020

COMPUTER SCIENCE THEORY VIII - MICROPROCESSOR ARCHITECTURE AND 8086 PROGRAMMING

Duration: 3 Hours **Max Marks: 80**

Section A

I. Answer any SEVEN of the following questions: **(7x2=14 Marks)**

1. Differentiate between the intsructions BUN and BSA.
2. Which are the 2 major types of computer organizations?
3. Give any 2 characteristics of CISC architecture.
4. Give one difference between CF and AF registers.
5. Differentiate between ENDP and ENDM.
6. What is the difference between LABEL and SHORT?
7. What is the use of SI and DI registers during string manipulation?
8. What is the use of the interrupt- INT 03H?

Section B

II. Answer any SIX of the following questions: **(6x6=36 Marks)**

9. Write a note on stored program organisation.
10. Write a note on typical program control instructions.
11. Explain the general purpose registers.
12. Explain the instruction types with examples.
13. With examples explain ROR and ROL.
14. Explain the following branch instructions:i) JA/JNBE ii)JE iii)LOOPE
15. What is the use of an Interrupt table? Explain.

Section C

III. Answer any THREE of the following questions: **(3x10=30 Marks)**

16. a) Explain any 5 arithmetic instructions. b) Explain the basic addressing modes with an example each.
17. Explain the following directives: (i) LENGTH (ii) ASSUME (iii) ENDS (iv) SEGMENT (v)OFFSET
18. (a) Write an assembly language program to count the logical 1's and 0's in one byte.
    (b) Write an assembly language program to count the zeros, positive and negative numbers in the given array.
19. What is an interrupt? Explain the types of interrupts. How does the interrupt work?

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