21ZOOC401   Reg No   :   ....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY 2024
ZOOLOGY

Gene Technology, Immunology and Computational Biology

Duration:2 Hours   Max Marks:60

SECTION - A

Answer the following strictly observing the internal choice provided: 4×5=20

UNIT 1

1) Explain screening of recombinants by Northern and Western blotting techniques.

OR

2) Describe the structure of Human Insulin.

UNIT 2

3) Draw a neat labelled diagram of MHC I and MHC II.

OR

4) What are Epitopes? Explain their role in Immune system.

UNIT 3

5) Explain pairwise alignmentt types in database analysis.

OR

6) Explain the scope and applications of Bioinformatics.

UNIT 4

7) Write a note on Standard error. Calculate Standard error for mean: The mean systolic blood pressure of 566 males is 128.8 mm and SD 13.05 mm.

OR

8) Write a short note on ANOVA.

SECTION - B

Answer the following strictly observing the internal choice provided: 4×10=40

UNIT 1

9) Give an account of transgenic animals.

OR

10) Explain the process of insertion of DNA by ligation of Cohesive ends and Blunt end Ligation.

UNIT 2

11) Explain innate and acquired immunity with illustrations.   .

<div align="center">OR</div>

12) Define Immune system. Explain primary and secondary immune responses.

UNIT 3

13) Explain Transplantation immunology. Add a note on Immuno-suppressors.

<div align="center">OR</div>

14) Explain the immunity exhibited against protozoan infections.

UNIT 4

15) Write a brief note on   (a) Population   (b) Sampling.

<div align="center">OR</div>

16) Explain Line graph with suitable examples.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY 2024
STATISTICS
Statistical Inference - I

Duration:2 Hours   **Max Marks:60**

Answer any THREE of the following :   **(3×2= 06)**

1. Define Unbiased Estimator.

2. When do you say that an estimator is sufficient?

3. Describe the method of Maximum Likelihood.

4. State the test procedure for testing the proportion $H_0:P=P_0$ Vs $H_1:P \neq P_0$.

5. Define Interval Estimation.

Answer any FOUR of the following in not more than a page each :   **(4×6= 24)**

6. According to Fisher explain the properties that has to be satisfied by a best estimator.

7. Explain a) Size and power of the test b) One tailed and two tailed tests with examples.

8. Find the moment estimators for the mean θ and vaiance σ^2 of a Normal population.

9. Deduce the B.C.R. of size α for testing $H_0 :P=P_0$ against $H_1 :P=P_1$ based on a random sample drawn from a Binomial population with an known parameter n.

10. Explain how do you test the signficance of difference of means of dependent samples?

11. Derive 100(1-α)% Confidence Interval for the Population Variance of a Normal population when the mean is unknown.

Answer any THREE of the following in not more than two page each :   **(3×10= 30)**

12. A random sample $x_1,x_2,....,x_n$ is taken from a Normal Population with mean zero and Variance σ^2 . Examine if $\frac{\sum xi^2}{n}$ is a MVB estimator for σ^2 ?

13. Estimate α and β for the following distribution by the method of moments

$$f(x, \alpha, \beta) = \frac{\beta^\alpha}{\Gamma\alpha} e^{-\beta x} x^{\alpha-1}; 0 \le x \le \infty$$

14. Derive LRTP for testing equality of means of two Normal populations whose variances are common but unknown.

15. Obtain UMP test procedure for testing $H_0: \mu = \mu_0$ against $H_1: \mu \ne \mu_0$ based on a random sample of size n drawn from a Normal population with an unknown variance σ^2.

16. Derive 100(1-α)% Confidence Interval for the ratio of two variances of two independent normal population with unknown means.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc FOURTH SEMESTER DEGREE EXAMINATION MAY 2024
MICROBIOLOGY
Microbial Enzymology and Metabolism

Duration:2 Hours   **Max Marks:60**

SECTION - A

Answer the following strictly observing the internal choice provided: 4×5=20

UNIT 1

1) Define an electron acceptor, donor and write briefly about respiration.

OR

2) Define fermentation, metabolism and write about the summary of ATP Production during glycolysis.

UNIT 2

3) Write briefly on biosynthesis of nucleotides.

OR

4) Write briefly on the role of nitrogenase enzyme in nitrogen fixation.

UNIT 3

5) Write a short note on Hydrolases and Transferases.

OR

6) Write a note on non sequential mechanism of enzymes.

UNIT 4

7) Write a note on Hanes-Woolf plot.

OR

8) Differentiate between Competitive and non competitive inhibition.

SECTION - B

Answer the following strictly observing the internal choice provided: 4×10=40

UNIT 1

9) Define Pasteur Effect and explain in detail about alcohol fermentation.

OR

10) Define fermentation and explain in detail Propionic acid fermentation.

UNIT 2

11) Define Glyoxylate Cycle and explain the similarities with TCA cycle and role in gluconeogenesis.

OR

12) Write in detail about Methanogens.

UNIT 3

13) Describe Ribozymes and abzymes.

OR

14) Explain the Lock and Key model of enzyme action. Add a note on the evidences to prove the hypothesis.

UNIT 4

15) Describe the concerted or symmetry model of allosteric enzymes. Add a note on homotropic and heterotropic regulation of allosteric enzymes.

OR

16) Describe regulation of enzymes by proteolytic cleavage.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY 2024
COMPUTER SCIENCE
Database Management Systems

Duration:2 Hours   **Max Marks:60**

PART A

Answer any FIVE questions: **(5×2= 10)**

1) What is Data Dictionary?

2) Write the characteristics of DBMS.

3) Draw the notations of attributes in E-R modeling.

4) Illustrate the use of NOT BETWEEN clause in selecting a tuple.

5) Define Updation anomalies.

6) What is a Transaction?

PART B

Answer any FIVE questions :   **(5×6= 30)**

7) Explain the characteristics and purpose of database approach.

8) Explain the structural constraints in E-R modeling.

9) Explain SUM function with an example.

10) Explain referential integrity constraint with an example.

11) a) What is rollback?   b) What is end transaction?

12) Explain the type of failure in DBMS.

PART C

Answer any TWO questions :   **(2×10= 20)**

13) What is Data independence? Explain.

14) Explain the various types of attributes in an E-R model.

15) Create the table clientmaster and use a check constraints on the client number field so that client number values starts with 'c', a check constraints on the name field so that name is entered in uppercase, a check constraints on the city column of clientmaster so that the cities Bombay, New Delhi, Madras, Calcutta are allowed. Solve the following queries.

a) Display the details of client whose name starts with 'R'.

b) Find the number of client living in Bombay.

c) Find the number of client with baldue more than 5000 and also their table balance.

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21CHEC401   Reg No   :   ....

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY 2024
CHEMISTRY
Inorganic and Physical Chemistry - II

Duration: 2 Hours   Max Marks:60

PART - A

I. Answer any Six from the following :   (2×6= 12 Marks)

1. Calculate the number of particles in the unit cell of sodium chloride.

2. Silver chloride is covalent while KCl is ionic. Give reason.

3. Define solvation energy and hydration energy.

4. What is molar heat capacity?

5. What is Chemisorption?

6. What is Inversion Temperature?

7. What is a catalyst ?

8. Calculate the entropy change when one mole of steam at a pressure of 101.3kPa is allowed to expand to 10.13kPa at constant temperature.

PART - B

II. Answer any SIX of the following choosing at least one question from each unit:

                                                                       (6×8= 48 Marks)

UNIT I

9. a) Write a note on the concept of resonance.
    b) Explain sp hybridisation with an example. (4+4)

10 a) Write the postulates of Valence Bond theory.
    b) Explain the hybridisation and shape of NH_4^+ molecule. (5+3)

UNIT II

11. a) Draw the molecular orbital energy level diagram for N_2 and explain its magnetic properties.
    b) Write four points of difference between BMO and ABMO. (5+3)

12 a) Explain Insulators and Semiconductors based on Band Theory.
    b) Write a short note on the properties of Metals. (4+4)

UNIT III

13. a) Write a note on Joule Thomson Experiment.

    b) Write a note on Third law of thermodynamics. (4+4)

14 a) Derive the expression of rate constant for second order reaction when (a=b).

    b) $ClCH_2CH_2Cl_{(g)} \rightarrow CH_2CHCl_{(g)} + HCl_{(g)}$

    At a certain temperature, this reaction follows second order kinetics with rate constant 0.00509 $mol^{-1}s^{-1}$. Suppose the concentration of $ClCH_2CH_2Cl$ is 1.45 mol. Calculate the concentration of $ClCH_2CH_2Cl$, 480s later.   (4+4)

UNIT IV

15. a) Describe two methods to determine the order of a reaction.

    b) Explain the determination of rate constant for the inversion of cane sugar. (4+4)

16. a) Derive an expression for the entropy change in terms of pressure and temperature.

    b) What is the physical meaning of entropy. (4+4)

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME

B.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY 2024

MATHEMATICS

Partial Differential Equations and Integral Transforms

Duration:2 Hours   Max Marks:60

PART - A

I. Answer any 6 questions. Each question carries 2 marks: (2×6= 12 Marks)

   a. Eliminate a and b from the following relation to form a partial differential equation:
   $$2z = (ax + y)^2 + b$$

   b. Solve : $z = px + qy + p^2 + q^2$.

   c. Solve : $r = a^2 t$

   d. Solve :$(D^3 - 3D^2 D' + 2DD'^2)z = 0$.

   e. Define Laplace transform of a function $F(t)$ and find $L\{1\}$.

   f. Find $L\{\cos^2 kt\}$.

   g. Find $L^{-1}\{\frac{36}{s^2+36}\}$.

   h. Find $L^{-1}\{\frac{1}{s^2+2s+5}\}$.

PART - B

2. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)

   a. Find the complete integral of $q = (z + px)^2$.

   b. Solve: $y^2(p^2 - 1) = x^2 q^2$.

   c. Solve: $\sqrt{p} + \sqrt{q} = y$.

   d. Solve: $(3z - 4y)p + (4x + 2z)q = 2y - 3x$.

PART - C

3. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)

   a. Reduce $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = 0$ to canonical form.

b. Reduce $x^2 r + 2xys + y^2 t = 0$ to canonical form.

c. Reduce $x \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = x^2$ to canonical form.

d. Solve : $xu_x - yu_y = 0$

PART - D

4. Answer any 2 questions. Each question carries 6 marks: **(6×2= 12 Marks)**

a. Derive the formula for $L\{\cos kt\}$.

b. Find $L\{t^2 \cos 2t\}$.

c. a) Define Gamma function and find $L\{t^{3/2}\}$.
   b) Write the value of $\Gamma(5)$.

d. Derive a formula for the Laplace Transform of a periodic function $F'(t)$ with period ω .

PART - E

5. Answer any 2 questions. Each question carries 6 marks: **(6×2= 12 Marks)**

a. (i) Find $L^{-1}\{\frac{k}{s(s^2+k^2)}\}$ using convolution theorem .
   (ii) Find $L\{(t-4)^2 \alpha(t-4)\}$.

b. Find and sketch $g(t) = L^{-1}\{\frac{5e^{-3s}}{s} - \frac{e^{-s}}{s}\}$.

c. Solve: $y''(t) + 4y(t) = 2t - 8$ with $y(0) = 1$, $y'(0) = 0$ using Laplace transforms.

d. Find the Fourier series of the function $f(t) = \begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < t < \pi \end{cases}$ with period 2π.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc FOURTH SEMESTER DEGREE EXAMINATION MAY 2024
BOTANY
Ecology and Conservation Biology

Duration:2 Hours   **Max Marks:60**

I. Answer any Five of the following :   **(5×2= 10 Marks)**

1. What is biogeochemical cycle?Mention two pools of nutrients in biogeochemical cycle.

2. Name any four injuries to plant caused by low temperature.

3. What is climax community?

4. What is pollution and pollutants?

5. Define Phtotochemical smog.

6. Define Phytogeography. Mention its significance

7. Define biodiversity and mention their types

8. What is critically endangered species ? Give an example

II. Answer any FOUR of the following :   **(4×5= 20 Marks)**

9. Write a note on morphological adaptations of xerophytes.

10. What is soil water?Explain the types of soil water.

11. Explain size and density in a population.

12. Explain pyramid of biomass.

13. Write a note on seed bank.

14. Explain the biotic components of the ecosystem.

15. Write the scientific name, family, parts used and uses of any two medicinal plants.

16. Write a note on Biodiversity conservation act

III. Answer any THREE of the following :   **(3×10= 30 Marks)**

17. Explain the morphological and anatomical characters of Hydrophytes.

18. Write a note on (i) food web (ii) food chain

19. Explain the process of formation of climax forest from the water body.

20. Explain the causes of biodiversity loss in detail.

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CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc FOURTH SEMESTER DEGREE EXAMINATION MAY 2024
PHYSICS
Thermal Physics and Electronics

Duration:2 Hours   **Max Marks:60**

PART - A

Answer any five questions, selecting minimum of one question from every unit: 5×9=45

UNIT I

1   a) Deduce the relation between slope of adiabatic and isothermal curves.

   b) Deduce Clausius-Clapeyron latent heat equation.   **(2+7)**

2   a) Calculate the change in entropy when a gas expands reversibly under isothermal condition.

   b) Represent the Carnot cycle on a Temperature-Entropy diagram and prove its area represents available energy.   **(2+7)**

UNIT II

3   a) Why does hydrogen show a heating effect in the porous plug experiment?

   b) With a neat diagram describe the process of regenerative cooling.   **(2+7)**

4   a) State Maxwell's law of equipartition of energy.

   b) Arrive at an expression for the Rayleigh - Jeans law in terms of the frequency.

                                                        (2+7)

UNIT III

5   a) What are the applications of a half wave rectifier?

   b) Draw and explain the characteristics of a p-n junction diode.   **(2+7)**

6   a) Define α_{dc} and β_{ac} of a transistor.

   b) Draw the structural diagram of n-channel JFET and explain its working.   **(2+7)**

UNIT IV

7   a) What are the characteristics of IC 741?

   b) Convert the following binary numbers into hexadecimal numbers. 10011, 11001

                                                        (2+7)

8   a) State De Morgan's second theorem.

    b) Construct OR, AND and NOT gates using NOR gates.   (2+7)

PART - B

Answer any three questions: 3×5= 15

9   Calculate the change in entropy when 5 kg of water at 100 ˚C is converted into steam at the same temperature. Latent heat of steam = 2.268 x 10^6 J/kg.

10 An iron ball having surface area 4 x 10^{-2} m^2 and at a temperature of 727˚C is placed in an enclosure at 227˚C. If surface emissivity of iron is 0.4, find heat radiated by the ball σ = 5.67 x 10^{-8} $Wm^{-2}K^{-4}$.

11 Find input voltage in inverting and non- inverting mode if R_1 = 20kΩ, r_f = 1MΩ, V_0= 2V.

12 Simplify the Boolean expression and draw the logic diagram for
    $$Y = (A + \bar{B})(\bar{A} + \bar{C})(\bar{B} + C).$$

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