St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V– Degree Examination
December - 2022
PHYSICS – PAPER VI
SOLID STATE PHYSICS

Time: 3 hrs.   Max Marks: 100

SECTION – A

1. **Answer any <u>TEN</u> of the following.**   (10×2=20)

a) Show that at high temperatures B-E statistics reduces to M-B statistics.

b) Define molar specific heat of a solid. What is its unit?

c) What are the objectives of statistical physics? Name any one area where the principles of statistical physics are used.

d) Name the modes of thermal conductivity in case of insulating materials.

e) What is Hall effect? Mention its significance.

f) Define drift velocity. Write the expression for it.

g) Distinguish between metals and semiconductors in terms of energy gap.

h) What is a unit cell? Name the crystal system that is described as $a=b\neq c$, $\alpha=\beta=\gamma=90°$.

i) What are Miller indices? Give the expression for interplanar spacing of a simple cubic structure in terms of Miller indices.

j) State Mosley's law. Give the expression for frequency of K_α lines according to Mosely's law.

k) What is glass transition temperature? Give its significance.

l) Distinguish between polar and nonpolar dielectric materials.

SECTION – B

Answer <u>TWO</u> full questions from each unit:

UNIT – I

2.a) Describe an experiment to determine the coefficient of thermal conductivity of an insulator.   (6)

b) Show that at high temperatures, Einstein's theory of specific heat of solids reduces to Dulong Petit's law.   (4)

3.a) Explain the three distribution laws used in physics. Show that at low densities the quantum statistics reduces to classical statistics.   (6)

b) Discuss Dulong-Petit's law. What are its limitations?   (4)

4.a) Discuss Einstein's theory of specific heat of solids.   (6)

b) What are the assumptions of Debye theory of Specific heat?   (4)

UNIT – II

5.a) With necessary diagram explain how Hall coefficient is measured.   (6)

b) What is an n- type semiconductor? Draw its energy level diagram.   (4)

6.a) Define Fermi energy and obtain an expression for it at absolute temperature. Hence obtain the expression for the average energy of the electrons. **(6)**

b) Discuss the variation of resistance of an intrinsic semiconductor with temperature. **(4)**

7.a) Obtain an expression for the electrical conductivity of an intrinsic semiconductor. **(6)**

b) Explain Lorentz – Drude model of a solid. **(4)**

UNIT – III

8.a) Distinguish between the diamagnetic, paramagnetic and ferromagnetic materials. **(6)**

b) Discuss ionic polarization and electronic polarization. **(4)**

9.a) Discuss the electrical, optical and thermal properties of glasses. **(6)**

b) Give the domain theory ferromagnetism. **(4)**

10.a) State Bragg's law and explain Bragg's spectrometer. **(6)**

b) How are characteristic X- rays produced? **(4)**

SECTION – C

Answer any <u>FOUR</u> of the following: **(4×5=20)**

11. Velocity of longitudinal and transverse waves in a metal are 6412m/s and 3218 m/s respectively. Calculate Debye's temperature if 6.023×10^{26} atoms exists in $1m^3$ of the material. Given: $h = 6.625 \times 10^{-34}$ Js and $k = 1.38 \times 10^{-23}$ J/K.

12. Calculate electrical conductivity of copper from the following data: Atomic weight of copper $=63.5$, density$= 8940$ kg/m^3, $N = 6.023 \times 10^{26}$ atoms/k mole, relaxation time $= 2.5 \times 10^{-14}$, $h = 6.625 \times 10^{-34}$ Js, $e = 1.6 \times 10^{-19}$ C and $m = 9.1 \times 10^{-31}$ kg.

13. Calculate the average energy of an electron at absolute zero in sodium metal assuming one free electron per atom. Given molecular weight of sodium is equal to 23 and density 970 kg/m^3.

14. Monochromatic X-rays of wavelength 5 Å are diffracted at an angle of 5° in the first order. What is the spacing between the adjacent planes of the crystal? At what angle will second maximum be seen?

15. The electron mobility and hole mobility of silicon are 0.17m^2/V-s and 0.035m^2/V-s respectively at room temperature. If the carrier concentration is 1.1×10^{16}/m^3, calculate the resistivity of silicon.

16. A parallel plate capacitor has an area 6.45×10^{-4} m^2 and the plates are separated by a distance of 2 mm across which a potential of 10V is applied. If a material with dielectric constant 6 is introduced between the plates, determine capacitance and polarization.

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G 501.5a

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December - 2022
PHYSICS – PAPER V
ATOMIC PHYSICS

Time: 3 hrs.

Max Marks: 100

SECTION – A

1. **Answer any <u>TEN</u> of the following.** (10×2=20)

   a) Can $^2P_{5/2}$ state exist? Give reason.

   b) What is the significance of principal quantum number n?

   c) State and explain Pauli's exclusion principle.

   d) Which atom model has introduced the concept of nucleus for an atom? For $l = 2$, write the possible values of m_l

   e) What are matter waves? What happens to de- Broglie wavelength of electron when its velocity increases?

   f) State and explain Heisenberg's uncertainty principle.

   g) What are eigen values of energy and eigen functions?

   h) What is meant by degeneracy? Give one example.

   i) Give the expression for the rotational energy of a diatomic molecule.

   j) H_2, N_2 and O_2 molecules do not show pure rotation spectrum. Give reason.

   k) What is meant by "depolarization ratio"? What is its significance?

   l) What is Compton effect? Write expression for Compton wavelength.

SECTION – B

Answer <u>TWO</u> full questions from each unit:

UNIT – I

2.a) Explain Bohr's atom model starting with two postulates. Also discuss merits and demerits of the model. (6)

   b) Explain L-S coupling and J-J coupling in multi electron systems. (4)

3.a) Obtain the expression for Zeeman shift using vector atom model (6)

   b) Explain the fine structure of Sodium D lines. (4)

4.a) Describe Stern-Gerlach experiment and explain the importance of the results obtained. (6)

   b) Explain briefly the quantum numbers l, s, m_l and m_s. (4)

UNIT – II

5.a) Explain de-Broglie hypothesis of matter waves and arrive at the expression for de-Broglie wavelength. Deduce the relation connecting de-Broglie wavelength of electron and i) kinetic energy ii) temperature. (6)

b) Based on uncertainty principle account for the finite width of spectral lines. **(4)**

6.a) Describe Davisson-Germer experiment and analyse the result obtained in support of de-Broglie hypothesis of matter waves. **(6)**

b) Using eigen values of energy and eigen functions for a particle in a three dimensional box, account for the degeneracy. **(4)**

7.a) Set up the time dependent Schrodinger wave equation. **(6)**

b) Explain gamma ray microscope experiment as an illustration for the uncertainty principle. **(4)**

UNIT – III

8.a) Assuming a diatomic molecule to be a rigid rotator, derive the expression for its rotational energy. Hence obtain the expression for the wave number of the spectral lines. **(6)**

b) Give the Quantum theory of Raman effect. **(4)**

9.a) Describe Milikan's oil drop experiment to determine the charge on an electron. **(6)**

b) Mention the different regions of molecular spectra. Explain the applications of molecular spectra. **(4)**

10.a) Derive the expression for the change in wavelength in Compton scattering. **(6)**

b) Explain the reason for blue colour of the sky in the day and the red colour of the rising and setting sun. **(4)**

SECTION – C

Answer any <u>FOUR</u> of the following: **(4×5=20)**

11. For quantum numbers $l = 2$ and $l = 3$ write down the values of m_l and represent them vectorially.

12. A source emitting monochromatic radiation of wavelength 486nm is subjected to a magnetic field of 0.4T. Calculate the Zeeman shift in frequency and Zeeman shift in wavelength.
Given e/m of electron $=1.76 \times 10^{11}$C/kg.

13. A proton is confined to a nucleus of radius 5×10^{-15}m. Calculate the uncertainty in i) linear momentum and ii) kinetic energy.
Given $m_p =1.67 \times 10^{-27}$ kg.

14. An electron is moving in a one-dimensional box of infinite height and width 0.1nm. Find the first three eigen values in eV.
Mass of electron $= 9.1 \times 10^{-31}$kg.
Given $h=6.625 \times 10^{-34}$ Js.

15. Find the minimum rotational energy of a CO molecule.
Mass of C atom $=12$amu,   mass of O atom $= 16$amu, 1amu $=1.66 \times 10^{-27}$kg
and bond length $= 0.15$nm.

16. A substance shows Raman line at 554.3nm when excited with a radiation of wavelength 546.1nm. Calculate the frequency and the wavelength of the corresponding anti stokes lines.

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G 502.5a

Reg. No.

St Aloysius College (Autonomous) Mangaluru

B.Sc. Semester V – Degree Examination

December - 2022

CHEMISTRY – PAPER V

Time: 3 hrs.

Max Marks: 100

Instructions: 1. Write the question number and subdivision clearly.

2. Write equations and diagrams wherever necessary.

3. Answer Part- A in the first two pages of the answer book.

PART - A

Answer any **TEN** of the following questions in 1 to 3 sentences.

(2×10=20)

1. a) What is Van't Hoff factor.

   b) What is meant by component of a system? Give an example.

   c) Give the mathematical expression of phase-rule.

   d) What are partially miscible liquids? Give an example.

   e) What is a Latimer diagram?

   f) Define magnetic susceptibility. Give its SI unit.

   g) Give an example for the application of complex formation in qualitative analysis.

   h) What is electrochemical series?

   i) What happens when furan undergoes acylation reaction in the presence of BF_3.

   j) Give the reaction for nitration of indole.

   k) Pyridine is more basic than pyrrole. Justify.

   l) Give the biological importance of Ca^{+2}.

PART - B

Answer any **TEN** of the following questions in 3 to 5 sentences.

(3×10=30)

2. (i) Explain desilverisation of lead.

   (ii) Describe the miscibility temperature -composition diagram of nicotine-water system.

   (iii) Draw the phase diagram of sulphur system.

   (iv) 7.5g of a substance in 100g of water produced a depression of 1.5°C in the freezing point of the solvent. Calculate the molecular mass of the substance. (K_f=1.85°C per 1000g of water)

   (v) Discuss the complexation reaction in Mac Arthur Forest Cyanide process for extraction of gold.

(vi) With a suitable example explain the application of complex formation in volumetric analysis.

(vii) Explain the complexation reaction in metallurgy of Al by discussing purification of Bauxite.

(viii) Discuss the rules governing the quenching of orbital contribution to magnetic moment.

(ix) Compare the aromaticity of pyrrole, furan and thiophene.

(x) Explain Paal Knorr synthesis of pyrrole.

(xi) Give a method of synthesis of isoquinoline.

(xii) Discuss the biological role of magnesium.

PART - C

Answer any <u>TEN</u> of the following questions.   (5×10=50)

3. Explain the phase diagram of sodium chloride -water system.

4. Derive the thermodynamic relation between elevation in boiling point and molecular mass of the solute.

5. Explain the determination of molecular mass of a solute by Beckmann's method.

6. State Raoult's law. Show that the relative lowering of vapour presuure is equal to mole fraction of the solute.

7. Explain redox stability in water based on Pourbaix diagram.

8. Discuss the applications of Frost diagram.

9. Explain the application of magnetic moment data for 3d complexes.

10. Discuss the variation of temperature on magnetic susceptibility of ferro and antiferromagnetic substances in comparison with paramagnetic substances.

11. What is Chichibabin reaction? Explain the mechanism.

12. With the help of molecular orbital diagram explain the aromatic character of thiophene.

13. Explain Skraup's synthesis of quinoline.

14. What is meant by sodium potassium pump? Explain its mechanism and importance.

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G 502.5b   Reg. No. ☐☐☐☐☐☐

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December - 2022
CHEMISTRY – PAPER VI

Time: 3 hrs.   Max Marks: 100

Instructions: 1. Write the question number and subdivision clearly.

2. Write equations and diagrams wherever necessary.

3. Answer Part- A in the first two pages of the answer book.

PART - A

Answer any <u>TEN</u> of the following questions in 1 to 3 sentences.

(2×10=20)

1. a) State de Broglie's hypothesis. Explain the terms.

   b) Write an expression for sinusoidal wave function and explain its terms.

   c) Why N_2 molecule is inactive to rotational spectroscopy?

   d) Give the expression for rotational constant, B and explain its terms.

   e) State Frank-Condon principle.

   f) State Laporte selection rule for electronic transition of transition metal complexes.

   g) Calculate microstates for d^2 system.

   h) How is sulphur nitride prepared?

   i) What are epimers?

   j) What is meant by prosthetic group?

   k) How are vitamins classified? Give an example for each class.

   l) Give an example of simple and mixed glycerides.

PART - B

Answer any <u>TEN</u> of the following questions in 3 to 5 sentences.

(3×10=30)

2. (i) Write the differences between classical mechanics and quantum mechanics.

   (ii) Write de Broglie equation. Calculate the wavelength of a stone of mass 1gm moving with a velocity 10 ms^{-1}. (h=6.626 x 10^{-34}Js)

   (iii) Explain the effect of isotopes on rotational spectra by taking ^{12}CO and ^{13}CO as examples.

   (iv) What is moment of inertia of a diatomic molecule whose internuclear distance is 150 pm and reduced mass is 1.5x 10^{-27} kg?

   (v) Explain bathochromic and hyperchromic shifts.

   (vi) What is spectrochemical series?

   (vii) Calculate the spectroscopic ground state of d^9 system.

   (viii) Give any three characteristics of inorganic polymers.

Contd...2

(ix)   How do you convert glucose into fructose?

(x)   Explain Gabriel synthesis of amino acid.

(xi)   Write a note on denaturation of proteins.

(xii) Explain the synthesis of vitamin C from D-Glucose.

PART - C

Answer any <u>TEN</u> of the following questions.   **(5×10= 50)**

3. Discuss the application of Schrodinger wave equation for particle in one dimensional box.

4. Explain photoelectric effect and compton effect.

5. Derive an expression for the wave number of rotational spectral line for a diatomic molecule.

6. The pure rotational spectra of HCl have equidistant lines at 2110 m^{-1}. What is the moment of inertia of the molecule? ($h=6.626\times10^{-34}$ Js; $c=3\times10^{8}ms^{-1}$)

7. Explain the application of colorimetry.

8. Explain the different types of transitions in transition metal complexes.

9. Explain in brief preparation of linear silicones and give any three applications of silicones.

10. Explain the structure of boron nitride.

11. Explain the mechanism of mutarotation.

12. Explain end group analysis of polypeptide.

13. Outline Killiani- Fischer synthesis.

14. Write the synthesis of vitamin A from β-ionone.

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G 503.5a   Reg. No: ☐☐☐☐☐☐

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December-2022
MATHEMATICS – Paper V
Algebra, Differential Equations and Laplace Transforms

Time: 3 Hours   Max. Marks: 100

Note: Answer all Parts

PART - A

Answer any TEN of the following: (10 x 2 ½ =25)

1. In a ring R, prove that $a(-b) = (-a)b = -(ab), \forall a, b \in R$.

2. Define Integral domain.

3. Prove that $\mathbb{Z}_n$ is not a field if n is not a prime.

4. Prove that every Euclidean domain has a unit element.

5. Show that the units in the ring $\mathbb{Z} + \mathbb{Z}i$ of Gaussian integers are $\pm 1, \pm i$.

6. Define Maximal ideal.

7. Solve $y'' + 4y' + 5y = 0$.

8. Find the particular integral of $(D^2 - D + 1)y = e^{2x} + e^x$.

9. Find the complementary function of $y'' + 4y = 3sinx$.

10. Transform $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10\left(x + \frac{1}{x}\right)$ to differential equation with constant coefficients using the substitution $z = \log x$.

11. Find 'A' in the method of variation of parameters to solve

    $(D^2 + 1)y = \sec x$ if $y = A\cos x + B\sin x$.

12. Consider $z = log(x + 2)$. Find complementary solution of $(x + 2)^2 y'' + 7(x + 2)y' - 12y = 3x^2 + 2x + 7$.

13. Find $L\{tcost\}$.

14. If $L\{f(t)\} = \frac{3}{s^2+4}, \forall s > 0$, find $f(t)$.

15. Evaluate $L^{-1}\left\{\frac{2s+1}{s(s+1)}\right\}$.

PART - B

UNIT - I

Answer any THREE of the following: (3 x 5 =15)

1. Prove that a finite integral domain is a field.

2. Let $f: R \rightarrow R'$ be a Ring Homomorphism. Then prove that f is a (1,1) map if and only if $ker f = 0$.

3. State and prove First Isomorphism theorem.

4. Let R be a commutative ring with 1 which is a simple ring. Prove that R is a field.

5. Let $\mathbb{Q}$ be the field of rational numbers. Then show that the only isomorphism of $\mathbb{Q}$ onto $\mathbb{Q}$ is the identity mapping $I_\mathbb{Q}$.

UNIT - II
Answer any THREE of the following: (3 x 5 = 15)

1. Prove that an ideal M in $\mathbb{Z}$ is a maximal ideal of $\mathbb{Z}$ if and only if $M = p\mathbb{Z}$ where p is a prime.

2. Prove that P is a prime ideal of $\mathbb{Z}$ if and only if either $P = 0$ or $P = p\mathbb{Z}$ for some prime p.

3. Prove that every prime element is irreducible.

4. Prove that in a Euclidean ring R an element a is a unit if and only if $d(a) = d(1)$.

5.   a) Define polynomial rings .
       b) Prove that $f(x) = x^2 + x + 1$ is irreducible over the ring of integers modulo 2.

UNIT - III
Answer any THREE of the following: (3 x 5 =15)

1. Solve: $(D^2 + 4D + 3)y = 2\sin 3x$.

2. Solve: $(D^3 + 3D^2 + 2D)y = x^2$.

3. Solve: $y'' - 5y' + 6y = e^{4x}(x^2 + 9)$.

4. Solve: $y'' - 2y' + y = (1 + e^{-x})^2$.

5. Solve: $(D^2 + 4)y = \cos 2x$.

UNIT - IV
Answer any THREE of the following: (3 x 5 =15)

1. Solve: $x^3 \frac{d^3 y}{dx^3} + 3x \frac{dy}{dx} + 2y = x^2 + 2x$.

2. Solve: $(1 + x)^2 y'' + (1 + x)y' + y = 4\cos\log(1 + x)$.

3. Solve $(D^2 + 2D + 1)y = (e^x + 1)^{-2}$ by the method of reduction of order.

4. Solve $y'' + y = cosec\ x$ by the method of variation of parameters.

5. Solve $y'' + (\cot x)y' + 4y cosec^2 x = 0$ by changing the independent variable.

UNIT - V
Answer any THREE of the following: (3 x 5 =15)

1. If $L\{f''(t)\} = \tan^{-1}(\frac{1}{s})$ and $f(0) = 2, f'(0) = -1$ find $L\{f(t)\}$.

2. Evaluate $L^{-1}\left\{\frac{1}{(s+1)(s^2+1)}\right\}$ using Convolution theorem.

3. If $f(t) = t^2, 0 < t < 2$ and $f(t + 2) = f(t)$ then find $L\{f(t)\}$.

4. Find the Laplace transform of $y(t) = \begin{cases} t^2 & 0 < t < 2 \\ 6 & t > 2 \end{cases}$ using step function.

5. A spring is stretched 1.5 inches by a 2-pound weight. Let the weight be pushed up 3 inches above equilibrium and then released. Describe the motion.

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G 503.5b(i)   Reg. No. :

St. Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December - 2022
MATHEMATICS – Paper VI
DISCRETE MATHEMATICS

Time: 3 Hours   **Max. Marks: 100**

Note: Answer all parts

PART – A

Answer any <u>TEN</u> of the following: **(10×2½=25)**

1. Define the terms: i) partially ordered set ii) chain.

2. If repetitions are allowed, find the number of ways to choose three out of seven days.

3. If $A = \{1, 2, 3\}$, write $P(A)$. Also find $|P(A)|$.

4. Define a strongly connected graph and give an example.

5. Show that $L = \{a^k | k = i^2, i \geq 1\}$ is not a finite state language.

6. Analyze the time complexity of the algorithm BUBBLESORT.

7. Define the terms rank and nullity of a graph. What is the rank of a connected graph with 16 vertices?

8. What are tractable and intractable problems?

9. Find the forward difference of the numeric function, $\begin{cases} 0, & 0 \leq r \leq 2 \\ 2^{-r} + 5 & r \geq 3 \end{cases}$.

10. Define Isomorphic graphs with an example.

11. Prove that the number of odd degree vertices in a graph is always even.

12. Find the numeric function for the generating function $A(Z) = \frac{1}{1+3Z}$.

13. Find the homogeneous solution of the difference equation, $a_r - 2a_{r-1} + a_{r-2} = 0$.

14. Obtain a binary tree for the prefix code $\{00, 10, 11, 010, 011\}$.

15. Prove that there is a unique path between every two vertices in a tree.

PART – B

UNIT - I

Answer any <u>THREE</u> of the following: **(3×5=15)**

1. Prove that the set of all real numbers between 0 and 1 is uncountably infinite.

2. Show that any integer composed of 3^n identical digits is divisible by 3^n.

3. If no three diagonals of a convex decagon meet at the same point inside the decagon, into how many line segments are the diagonals divided by their intersections?

4. Let $T = \{a, b, c, d, +, *, (,), =\}, N = \{S, exp, term, factor, id\}$, with S as the starting symbol. Let the productions be

$$S \rightarrow id = exp$$
$$exp \rightarrow exp + term$$
$$exp \rightarrow term$$
$$term \rightarrow term * factor$$
$$term \rightarrow factor$$
$$factor \rightarrow (exp)$$
$$factor \rightarrow id$$
$$id \rightarrow a$$
$$id \rightarrow b$$
$$id \rightarrow c$$
$$id \rightarrow d$$

Write down the productions to obtain the sentence $c = a * b + d * (d + b)$.

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

UNIT – II

Answer any __TWO__ of the following: (2× 7½=15)

1. 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.

2. For any connected planar graph, prove with usual notations that
$v - e + r = 2$.

3. Prove that there is always a Hamiltonian path in a directed complete graph.

4. For the following graph,

        a) Give an example of a path that is simple but not elementary

        b) Give an example of an elementary circuit.
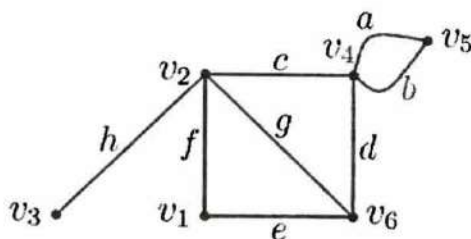
UNIT – III

Answer any __THREE__ of the following: (3×5=15)

1. Describe an algorithm for determining a minimum spanning tree of a connected weighted graph.

2. For a given spanning tree, let $D = \{e_1, e_2, \ldots\ldots, e_k\}$ be a fundamental cut-set in which e_1 is a branch and $e_2, e_3, \ldots\ldots, e_k$ are chords of the spanning tree. Prove that the branch e_1 is contained in the fundamental circuits corresponding to the chords $e_2, e_3, \ldots, e_k$ and that e_1 is not contained in any other fundamentals circuit

3. Define a fundamental cut-set and find all the fundamental cut-sets with respect to the spanning tree $T = \{a, b, c, d\}$ of the following graph:
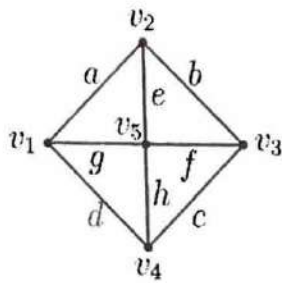
4. Prove that every circuit has an even number of edges in common with every cut-set.

5. Define a tree. If G is a tree with v vertices and e edges, then prove that $= v - 1$.

UNIT – IV

Answer any TWO of the following: (2× 7½=15)

1. Describe the algorithm LARGEST 2 for finding the largest of the n numbers. Also justify it with a formal proof.

2. Design a modulo-3 counter that receives a sequences of 0's, 1's and 2's as input and produces a sequence of 0's, 1's and 2's as output such that at any instant the output is equal to the modulo 3 sum of the digits in the input sequence. Give the tabular form and graphical representation.

3. Show that the language $L = \{a^k b^k | k \geq 1\}$ is not a finite state language.

4. Define equivalent machines. Write the machine equivalent to the following machine and explain the procedure:

	Input		
State	1	2	Output
A	B	C	0
B	F	D	0
C	G	E	0
D	H	B	0
E	B	F	1
F	D	H	0
G	E	B	0
H	B	C	1

UNIT – V

Answer any THREE of the following: (3×5=15)

1. If $c = a * b$ where $a_r = 3^r, r \geq 0$ and $b_r = 2^r, r \geq 0$, find c_r using generating functions.

2. Determine the numeric functions a_r and b_r corresponding to the generating functions $A(z) = \frac{2}{1-4z^2}$ and $B(z) = \frac{9}{1-3z}$.

3. Find the particular solution of $a_r + 5a_{r-1} + 6a_{r-2} = 3r^2$.

4. Write the difference equation of the Fibonacci sequence and find its solutions.

5. Find the homogeneous solution of the difference equation,
$a_r + 6a_{r-1} + 12a_{r-2} + 8a_{r-3} = 0$.

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G 503.5b(iii)

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December 2022

MATHEMATICS - PAPER VI
GRAPH THEORY

Time: 3 Hours.   Max Marks: 100

PART –A

I   **Answer any <u>TEN</u> of the following:**   (10X2½=25)

1. Prove that if a graph has exactly two vertices of odd degree then there must be a path joining these two vertices.

2. Define a Euler graph and one example of Euler graph.

3. Prove that for a complete graph number of edges is $\frac{n(n-1)}{2}$.

4. Define distance in a graph.

5. In a binary tree of n vertices the number of pendant vertices is given by $p = \frac{n+1}{2}$.

6. Define incidence matrix of a graph.

7. Find eccentricity of the graph:
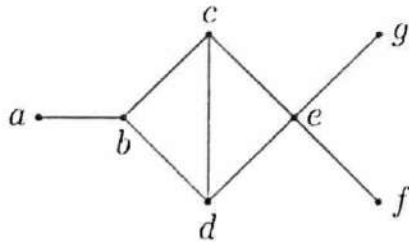
8. Define planar and non-planar graphs with an example.

9. Define the vertex connectivity and edge connectivity of a graph with example.

10. Define the term chromatic colouring of a graph give one example.

11. Find the adjacency matrix of the following graph:
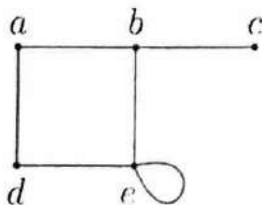
12. Define symmetric and asymmetric digraph.

13. Define arborescence and give one example.

14. Draw a labeled tree corresponding to the sequence (1, 1, 3, 5, 5, 5, 7, 7, 7, 9).

15. Write the adjacency matrix of the digraph given below
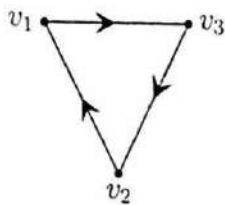
PART – B
UNIT I
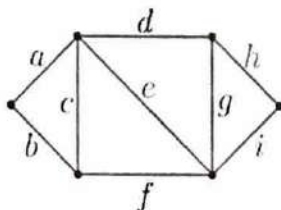**Answer any <u>THREE</u> of the following:**   **(3X5=15)**

1. Define pendent vertex. Prove that there are at least two pendent vertices in a tree.

2. Prove that a simple graph with n vertices and k components can have at most $\dfrac{(n-k)(n-k+1)}{2}$ edges.

3. Prove that a tree with n vertices has $(n-1)$ edges.

4. Prove that a connected graph G is an Euler graph if and only if it can be decomposed into circuits.

5. Define Spanning tree and show that every connected graph has atleast one spanning tree.

UNIT II
Answer any <u>THREE</u> of the following: **(3X5=15)**

1. With respect to a given spanning tree T, prove that a branch $b_{,}$, that determines a fundamental cutset S is contained in every fundamental circuit associated with chords in S and in no others.

2. Define fundamental cutset in a connected graph and list all the fundamental cutsets for the following graph with respect to the given spanning tree $T = \{a, c, f, g, h\}$.


3. Prove that $K_{3,3}$ is nonplanar.

4. Prove that a connected planar graph with n vertices and e edges has $e-n+2$ regions.

5. Prove that a graph is a planar graph if and only if it can be embedded on the surface of a sphere.

UNIT III
Answer any THREE of the following: (3X5=15)

1. Prove that the rank of an incidence matrix of a connected graph with n vertices is $(n-1)$.

2. Prove that the rank of the circuit matrix of a connected graph with e edges and n vertices is $e-n+1$.

3. Write the fundamental circuit matrix for the following graph:
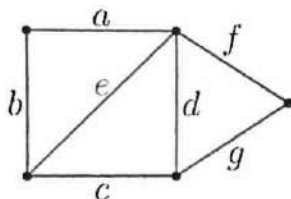
4. Let B and A be the circuit matrix and incidence matrix of a self loop free graph whose columns are arranged using the same order of edges. Then prove that every row of B is orthogonal to every row of A i.e, $AB^T \equiv 0(mod\ 2)$.

5. Define path matrix of a graph and Write the path matrix for the vertices v_1 and v_4 in the following graph.
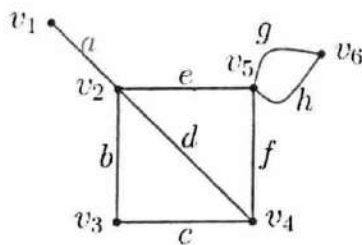
UNIT IV

Answer any THREE of the following: (3X5=15)

1. Prove that a graph of n vertices is a complete graph if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda-1)(\lambda-2)...(\lambda-n+1)$.

2. Prove that a graph of n vertices is a tree if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda-1)^{n-1}$

3. 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 a simple graph obtained from G by fusing the vertices a and b together and replacing set of parallel edges by single edge then $P_n(\lambda)$ of $G = P_n(\lambda)$ of $G' + P_{n-1}(\lambda)$ of G''.

4. Prove that every tree with two or more vertices is 2-chromatic.

5. Find the chromatic polynomial of the following graph:
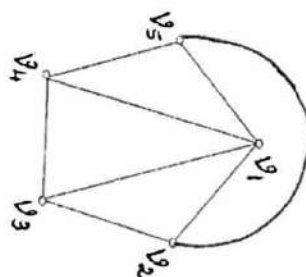
UNIT V

Answer any <u>THREE</u> of the following: **(3X5=15)**

1. Prove that the number of simple labeled graph is $2^{\frac{n(n-1)}{2}}$.

2. Draw the digraph of the given incidence matrix.

$$
\begin{array}{c}
 & \begin{array}{cccc} a & b & c & d \end{array} \\
\begin{array}{c} v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} & \left(\begin{array}{cccc}
1 & 0 & -1 & 0 \\
-1 & 1 & 0 & 0 \\
0 & -1 & 1 & 1 \\
0 & 0 & 0 & -1
\end{array}\right)
\end{array}
$$

3. Show that the determinant of every square sub matrix of the incidence matrix of a digraph is 1, -1 or 0.

4. Prove that a digraph G is an Euler digraph if and only if G is connected and is balanced

5. Let B and A be respectively, the circuit matrix and incidence matrix of a self-loop free digraph such that the columns in B and A are arranged using the same order of edges. Then prove that $A.B^T = B.A^T = 0$.

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G. 503.5b(iv)   Reg. No: ☐☐☐☐☐

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December – 2022
MATHEMATICS – Paper VI
LINEAR PROGRAMMING

Time: 3 Hours   Max. Marks: 100

Note: Answer all parts

PART – A

Answer any TEN of the following: (10x2½=25)

1. Define a) Polyhedral Convex set

   b) Extreme point.

2. Pivot on $a_{12} = 2$ in the following canonical maximum table :

x	y	-1	
1	2	7	$= -t_1$
4	5	8	$= -t_2$
3	6	9	$= f$

3. Convert the following LPP into the maximum table:
   Maximize: $f(x, y) = -x - 2y$
   subject to $2x - y \geq -1$
   $\qquad\qquad 3y - x \leq 8$
   $\qquad\qquad x \geq 0, y \geq 0.$

4. State the canonical minimization LPP of the following:

x	20	25	300
y	40	20	500
-1	1000	800	0
	$= t_1$	$= t_2$	$= g$

5. Write the maximum table taking the negative transpose of the minimum table:

x	1	3	6
y	2	4	5
-1	8	7	0
	$= t_1$	$= t_2$	$= g$

6. State the dual canonical minimization LPP for the following:
   Maximize: $f(x_1, x_2) = x_1 + x_2$
   Subject to $x_1 + 2x_2 \leq 4$
   $\qquad\qquad 3x_1 + x_2 \leq 6$
   $\qquad\qquad x_1 \geq 0, x_2 \geq 0.$

7. Write the matrix reformulation of canonical maximization LPP.

8. Reduce the table of the matrix game:
$$\begin{bmatrix} -1 & 1 & -1 & 2 \\ -1 & -1 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$$

9. Define mixed strategy and pure strategy for row player in the matrix game.

10. Explain the process of converting an unbalanced transportation problem to balanced transportation problem when supply is more than demand.

11. Find the two-permutation set of zeros in the following table of balanced assignment problem:

0	0	1
0	0	0
1	0	0

12. Construct a cycle using circled cells in the following table :

c_{11}	c_{12}	c_{13}
c_{21}	c_{22}	c_{23}
c_{31}	c_{32}	c_{33}

13. Define an α – path in a capacitated directed network.

14. Prove that any flow in a capacitated directed network satisfies $\sum_j \phi (v_j) = 0$.

15. Define
   a) Net input flow
   b) Source in a capacitated directed network.

PART – B

UNIT – I

Answer any TWO of the following: (2x7½=15)

1. A company manufactures heaters and air conditioners. The production of one heater requires 2 hours in the parts division and 1 hour in the assembly division of the company. The production of one air conditioner requires 1 hour in the parts division and 2 hours in the assembly division of the company. The parts division is operated for at most 8 hours per day and the assembly division is operated for at most 10 hours per day. If the profit realized upon sale is \$30 per heater and \$50 per air conditioner, how many heaters and air conditioners should the company manufacture per day so as to maximize profits? Solve graphically.

2. Solve the L.P.P.

x	y	-1	
-1	-2	-3	$= -t_1$
1	1	3	$= -t_2$
1	1	2	$= -t_3$
-2	4	0	$= f$

3. Solve the L.P.P.

        Maximize $f(x, y) = x$

        Subject to : $x + y \leq 1$

                  $x - y \geq 1$

                  $y - 2x \geq 1$

                  $x, y \geq 0.$

4. State the complete simplex algorithm for the maximum table.

UNIT – II

Answer any TWO of the following: (2x7½=15)

1. State dual simplex algorithm for minimum table.

2. Solve: Maximize $f(x, y) = x + 3y$
         Subject to $x + 2y \leq 10$
                $-3x - y \leq -15.$

3. Solve the following minimum LPP:

x	-2	1	-3
y	1	-2	-2
-1	1	0	0
	$= t_1$	$= t_2$	$= g$

4. Solve the dual canonical LPP:

	x_1	x_2	-1	
y_1	1	2	20	$= -t_1$
y_2	2	2	30	$= -t_2$
y_3	2	1	25	$= -t_3$
-1	200	150	0	$= f$
	$= s_1$	$= s_2$	$= g$	

UNIT – III

Answer any TWO of the following: (2x7½=15)

1. Solve the matrix game and find optimal strategies:

$$\begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix}$$

2. Solve the dual non canonical L.P.P. below.

	x_1	x_2	-1	
y_1	2	-1	-1	$=-0$
y_2	-1	1	-1	$=-t_1$
-1	2	1	0	$=f$
	$=0$	$=s_1$	$=g$	

3. Solve the dual non-canonical L.P.P. below.

	x_1	x_2	x_3	-1	
y_1	1	-1	2	1	$=-0$
y_2	2	0	2	-1	$=-t_1$
y_3	0	1	-1	-1	$=-t_2$
-1	1	-1	3	0	$=f$
	$=0$	$=0$	$=s_1$	$=g$	

4. Solve the matrix game and find optimal strategies:

$$\begin{bmatrix} 1 & 2 \\ 6 & -2 \end{bmatrix}$$

UNIT- IV

Answer any TWO of the following: (2x7½=15)

1. State Transportation Algorithm to solve a balanced transportation problem.

2. Solve the assignment problem below:

2	3	2	4
5	8	4	3
5	9	5	2
7	6	7	4

3. Solve the Transportation problem given below:

|	M_1	M_2	M_3	
W_1	3	2	1	30
W_2	2	5	9	75
	40	30	50	

4. State the Hungarian algorithm to solve a balanced assignment problem.

UNIT – V

Answer any TWO of the following: (2x7½=15)

1. Show that in a capicitated directed network with unique fixed source and unique fixed sink, no edges into the source and no edges out of the sink, the value of the maximum flow is less than or equal to the minimal cut capacity.

2. Solve the maximal flow network problem. Display the corresponding cut and cutset.
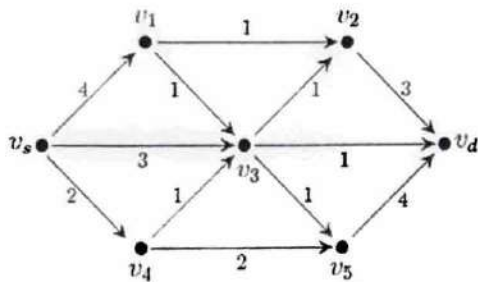
3. State the shortest path network problem and shortest path algorithm I.

4. Solve the shortest – path network problem below. Also give the shortest path and path value.
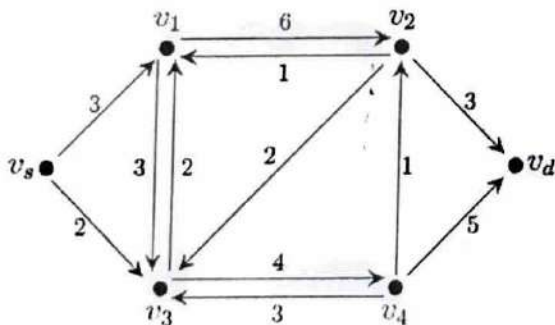
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Note: This question paper has THREE sections. Section A, Section B and Section C. Answer all the sections.

Max Marks: 100

Time: 3 hrs.

SECTION – A

1. **Choose the correct answer from the choices given at the end of each question and write the correct answer.** (12x1=12)

   i) The line scanning frequency of interlaced scanning in CCIR-B system is _____

   (a) 525Hz   (b) 50Hz   (c) 25Hz   (d) 15,625Hz

   ii) The difference between the sound and picture carrier frequency of a monochrome TV in CCIR-B system is _____

   a) 2MHz   b) 5.5MHz   c) 10MHz   d) 20MHz

   iii) The frame repetition frequency in progressive scanning of CCIR-B standard TV communication is_____

   a) 25Hz   b) 50Hz   c) 60Hz   d) 100Hz

   iv) Solar cell works on the principle of _____

   a) Photovoltaic effect   b) photoconduction
   c) thermionic emission   d) photo emission

   v) In an optical fiber, the numerical aperture is used to describe the ability of _____

   a) Light collection   b) light scattering
   c) light dispersion   d) light polarization

   vi) Optical fibers reject radio frequency and electromagnetic interference because they are made of _____ material

   a) thin   b) transparent   c) insulator   d) conducting

   vii) A PWM signal can be generated by_____ circuit.

   a) clipper   b) comparator
   c) differentiator   d) integrator

   viii) The sequence of operations in which PCM is done is _____

   a) Sampling, quantizing, encoding   b) Quantizing, encoding, sampling
   c) Quantizing, sampling, encoding   d) Sampling, quantizing, compading

   ix) Duplex Distance in GSM system is _____

   a)20MHz   b) 25MHz   c)40MHz   d) 45MHz

x) GSM chose a combination of_____ as its method of multiple access technique.

a) TDMA & FDMA   b) CDMA & FDMA   c) TDMA only   d) TDMA & CDMA

xi) The term SIM stands for _____

a) System Identification Module   b) Subscriber's identity module

c) Subscriber's identity modem   d) system identity mode.

xii) _____ domain is restricted to qualified organizations.

a) .net   b) .org   c).com   d).edu

2. Answer any TEN questions.   **(10x1=10)**

i) Define the term scanning?

ii) Name the types of modulations used for sound and video signals in TV.

iii) What is the time taken for tracing one line of a picture content in a frame?

iv) Write the electrical symbol of a LASCR.

v) Name the physical phenomenon by which light is guided through fibres.

vi) Define the term quantum efficiency w.r.to optical detectors.

vii) Mention one difference between PWM and PPM

viii) Name the two steps involved in the process of PCM?

ix) State Nyquist's sampling theorem.

x) Give the full form of PSTN

xi) What is meant by handoff in mobile communication?

xii) Expand the term DSSS.

3. Answer any TEN questions.   **(10x2=20)**

i) Explain VSB modulation.

ii) Mention the components of CVS.

iii) Determine height and width of a TV screen of 42 inch size.

iv) Mention the advantages of solid-state relay as compared to mechanical relay.

v) Differentiate between single mode and multimode fibers.

vi) What is meant by direct bandgap material? Give one example,

vii) Mention any two advantages of digital communication.

viii) What are PN codes? Explain.

ix) Differentiate between FHSS and THSS.

x) Define 'cell' w.r.to mobile communication system. Why hexagonal shape is universally adapted for a cell in the system.

xi) Expand the terms IMEI and MSI

xii) Briefly explain internet banking.

SECTION – B

4. **Answer any SEVEN questions.**   (7x4=28)

i) Write a note on Plumbicon camera tubes.

ii) With diagram explain a monochrome picture tube.

iii) Find the Numerical aperture and Acceptance angle of an optic fiber which is immersed in a liquid of refractive index 1.35. Given Refractive index of core is 1.55 and that of cladding is 1.45.

iv) With diagram explain a solar cell.

v) With circuit and characteristic diagram explain an Avalanche diode detector.

vi) With necessary diagrams explain (a)Cell splitting (b) Frequency reuse with respect to mobile communication.

vii) With diagram explain the generation of PAM signal.

viii) When 3×10^{11} photons each with a wavelength of 0.85µm are incident on a photodiode, an average 1.2×10^{11} electrons are collected at the terminals of the device. Determine the quantum efficiency and the responsivity of the photodiode at 0.85µm.

ix) Write a note on search engines.

X) Write a note on 'email' and 'www'.

SECTION – C

Answer any THREE full questions.   (10x3=30)

5. a) Draw the block diagram of monochrome TV transmitter and explain   (5)
its audio section.

 b) Explain the classification of fibres based on the number of modes   (5)
they support.

6. a) With block diagram explain the optical communication link   (5)

 b) For a channel lying in the range (61-68) MHz, determine   (5)

　　　　a) The value of picture carrier frequency

　　　　b) The value of sound carrier frequency

　　　　c) The value of SIF and VIF

　　　　d) Draw the channel diagram

7. a) With a block diagram explain GSM architecture   (5)

 b) Obtain an expression for the numerical aperture and acceptance   (5)
angle of an optical fiber

8. a) Define Quantum efficiency and Responsivity of a Photodetector and   (5)
hence derive the relationship between Quantum efficiency and
Responsivity of a Photo detector.

 b) Discuss the various losses in optical fibre.   (5)

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G 504.5b   Reg. No:

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December – 2022
ELECTRONICS – PAPER VI
8085 Microprocessor and 8051 Microcontroller

Note: This question paper has three sections. Section A, Section B and Section C. Answer all the sections.

Time: 3 hrs.   Max Marks: 100

SECTION – A

Choose the correct answer from the choices given at the end of each

1. **question and write the correct answer.**   **(12x1=12)**

   i)   The instruction XCHG of 8085 μP exchanges the contents of _____ registers.

        a) HL and DE   b) HL and BC   c) HL and SP   d) DC and BE

   ii) PC register of 8085 μP is -----bit.

        a) 8   b)12   c) 16   d) 32

   iii) 8051 μC has -----math flags.

        a) 4   b) 3   c) 5   d) 6

   iv) _____ register of μC does not have the internal address.

        a) SP   b) DPL   c) PC   d) PSW

   v)   ------ is the content of PC after reset in the case of 8051 μC.

        a) 0000H   b) 1111H   c) A = 9999H   d) A= FFFFH

   vi) _____ instruction is invalid in 8051 μC.

        a) MOV 30h, #40h   b) MOV R0,R7   c) MOV 50,@R_0 d) DEC DPTR

   vii) The branch instruction **JZ, target,** in 8051 controller branches to the specified target if------.

        a) A=FFH   b) A=00H   c) R0=00H   d) CF=0

   viii) DPTR of 8051 μC is _____ bit register.

        a) 8   b) 16   c) 32   d) 4

   ix) If clock frequency of 8051 μC is 15MHz, then time taken for 1 machine cycle is _____

        a) 0.8 μs b) 0.08 μs c) 0.8ms   d) 0.08ms

   x)   After execution of DIV AB instruction in 8051 μC the quotient is placed in _____ register.

        a) R_0 b) R_1 c) A   d) B

   xi) The size of internal RAM of 8051 μC is _____.

        a) 4 K bytes   b) 128 bytes   c) 256 bytes   d) 512 bytes

   xii) 8051 μC has_____ interrupts

        a) 2   b) 3   c)4   d) 5

G 504.5b

2. **Answer any <u>TEN</u> questions.**

   i) What is the state of zero flag after the execution of the instruction XRL A,A in 8085 μP?

   ii) What is the size of address bus in 8085μp?

   iii) What is the addressing mode of the instruction MOV M,A in 8085 μP.

   iv) Write any one instruction of 8081 μC to load an 8-bit data to the accumulator directly from a memory location.

   v) Which instruction of 8051 μC is used to interchange the nibbles of the Accumulator?

   vi) Give the instruction used to initialize the stack in 8085 μP.

   vii) By default which register bank is accessed in 8051μC?

   viii) Give the syntax of the instruction JNB of 8051 μC.

   ix) Write the content of Accumulator after execution of following set of instructions in 8085 μP

   $$MVI \ A, \ 65h$$
   $$SBI \ 35h$$

   x) Mention the use of PC register in 8085μP?

   xi) Mention any one use of A register of 8051 μC.

   xii) Which instruction of 8051 μC is used for comparing two bytes of data?

3. **Answer any <u>TEN</u> questions.**

   i) Explain the role of RS_0 and RS_1 bits in PSW of 8051 μC.

   ii) With example explain indirect addressing mode of 8085 μP.

   iii) Mention any two uses of HL register pair in 8085 μP.

   iv) Explain the PUSH instruction of 8051 μC.

   v) Mention any two differences between a microcontroller and microprocessor.

   vi) Explain any one logical instruction of 8051 μC.

   vii) Write an 8051 μC program to multiply 08h and 02h without using arithmetic instructions.

   viii) With example explain how a particular bit of addressable RAM location is cleared in 8051?

   ix) With example explain MUL instruction of 8051 μC.

   x) Mention the non maskable interrupts of 8055 μC.

   xi) With example explain any one bit addressable instruction of 8051 μC.

   xii) With example explain DJNZ command in 8051 μC.

SECTION – B

12 **Answer any <u>SEVEN</u> questions.**

   i) Explain the general purpose registers of 8085

   ii) With bit pattern diagram, explain the flag register of 8085 μP.

   iii) Write a note on interrupts of 8085 processor.

   iv) Explain the functions of ports of 8051 controller.

v) Write a note on stack pointer and data pointer registers of 8051 μC

vi) With example explain any two addressing modes of 8051 μC.

vii) Write a 8051 program to divide two 8-bit numbers.

viii) With example explain any two, logic instructions of 8051 controller.

ix) Write a note on the various modes of timers of 8051 μC

x) With example explain any two conditional Jump instructions of 8085 μP

SECTION – C

Answer any THREE full questions. (10x3=30)

5. a) Draw the labeled diagram of architecture of 8085 μP and explain the status signals of 8085 μP **(6)**

b) With necessary examples explain any two addressing modes of 8085 μC **(4)**

6. a) With necessary diagram explain the organization of internal RAM of 8051 μC. **(5)**

b) With bit pattern explain the PSW of 8051 μC **(5)**

7. a) What is stack? With example explain how data is stored and retrieved in stack of 8051 μC **(5)**

b) Write an 8051 μC program to compare two bytes of data stored at external memory locations X and X+1. Store the largest in the external memory location X+2. **(5)**

8. a) With an example explain the mechanism of operation of a subroutine. **(5)**

(b) Write an 8051 μC program to subtract two bytes of data stored at external memory locations X and X+1. Store the result in the external memory location X+2. **(5)**

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PART –A

1. **Answer any <u>TEN</u> of the following.**   (10x2=20)

   a) Distinguish between job scheduling and CPU scheduling.

   b) What is a Thread?

   c) What is PCB? Mention any four fields of PCB.

   d) Differentiate between waiting time and turnaround time.

   e) What is virtual memory? Why is it needed?

   f) What is Physical address space?

   g) What is Swapping?

   h) Define the terms throughput and response time.

   i) What is physical address space?

   j) What is the use of sort command?

   k) List the relational operators and their meaning in Linux.

   l) Explain the pwd command.

PART –B

Answer any <u>ONE FULL</u> question from each unit.   (4x20=80)

UNIT – I

2. a) Write a note on

   i) Time sharing system.   ii) Real time system.   (8)

   b) Explain the services of Operating System.   (6)

   c) Explain the benefits of using threads.   (6)

3. a) What is a process? Draw and explain the process state diagram. (8)

   b) Mention and explain different threading models.   (6)

   c) Write a note on i) Multimedia Systems ii) Handheld Systems   (6)

UNIT – II

4. a) Explain in brief any two problems of Synchronization.   (8)

   b) Explain the FCFS algorithm, with an example.   (6)

   c) Explain three requirements of a solution to the critical section problem. (6)

5. a) Explain the following with example

   i) SJF Algorithm   ii) Priority Scheduling   (8)

   b) Explain Round –Robin scheduling algorithm with example.   (6)

   c) Explain readers-writers problem.   (6)

UNIT – III

6. a) Explain Deadlock recovery techniques and deadlock detection methods.   **(8)**

   b) Explain Banker's algorithm for dead lock avoidance.   **(6)**

   c) Compare and contrast swapping and demand paging.   **(6)**

7. a) What is LRU page replacement with three frames of the memory and the page reference string

   7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1

   Write the steps to find the number of **page faults** using LRU page replacement.   **(8)**

   b) Explain the necessary conditions to prevent deadlock.   **(6)**

   c) Write a note on fragmentation.   **(6)**

UNIT – IV

8. a) Explain the 'while loop' and 'for loop' with syntax and example.   **(8)**

   b) Explain the different forms of if statements in Linux with example.   **(6)**

   c) Write a shell script to generate Fibonacci numbers up to N.   **(6)**

9. a) Explain switch statement in Linux with example.   **(8)**

   b) Write a note on vi editor.   **(6)**

   c) Explain the various features of Linux.   **(6)**

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(2019 Batch Onwards)

Reg. No.: ☐☐☐☐☐☐

St Aloysius College (Autonomous)
Mangaluru

B.Sc. Semester V – Degree Examination
December - 2022
COMPUTER SCIENCE – PAPER VI
PYTHON PROGRAMMING

Time: 3Hours.

Max Marks: 100

PART –A

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

a) Define the term portability.

b) What is the output of the python code snippet?

   print 1,000,000

c) Define recursion.

d) Define PVM.

e) Write the python code to display current date and time.

f) What will be the output of the following code snippet?

   print(2**3 + (5 + 6)**(1 + 1))

g) What does pip stand for in python?

h) What is tuple? Create tuple with single element.

i) In which programming language is Python written?

j) What will be the output of the following code snippet?

   s1 = {1, 2, 3, 4, 5}

   s2 = {2, 4, 6}

   print(s1 ^ s2)

k) What will be the output of the following code snippet?

   def check(a):
   print("Even" if a % 2 == 0 else "Odd")

   check(12)

l) Write the python code to find the largest of three given numbers.

PART –B

Answer any ONE FULL question from each unit.   (4x20=80)

UNIT - I

2. a) List the silent features of python programming language.   (8)

   b) What are the different flow control statements supports in python. Explain any 3 with a suitable example program.   (6)

   c) What is a function? How to define a function in python? Write a program using function to find out the given string is palindrome or not.   (6)

3. a) What is local and global scope of variable in python? Explain the different scenarios with an example snippet. **(8)**

   b) Explain the various string methods with examples. **(6)**

   c) Write a python program to calculate the area of circle, rectangle and triangle. Print the results. **(6)**

UNIT – II

4. a) What is list? Explain the concept of slicing and indexing with proper examples. **(8)**

   b) What is a class? How to define a class in python? How to instantiate a class and how the class members are accessed. **(6)**

   c) What is dictionary? Illustrate the usage of nested dictionary with an example program. **(6)**

5. a) Discuss various dictionary methods with examples. **(8)**

   b) How is tuple different from a list and which function is used to convert list to tuple. Explain with example. **(6)**

   c) Explain the various set operations with suitable examples. **(6)**

UNIT – III

6. a) Define exception. Explain how exceptions are handled in python? **(8)**

   b) Write a python program to generate user defined exception. **(6)**

   c) Explain the various model of file access methods in python. **(6)**

7. a) Explain the various file object methods. **(8)**

   b) Explain the different types of error. Differentiate between an Error and Exception. **(6)**

   c) List and explain the python built-in exceptions. **(6)**

UNIT – IV

8. a) Write a short note on Urllib3 get request and head request. **(8)**

   b) Explain the various database connection object methods. **(6)**

   c) Explain any three inbuilt methods of BeautifulSoup API. **(6)**

9. a) Write a python database program to display the contents of a table student(name text, registerno integer, class text) **(8)**

   b) Explain implementation of web scrapping in python with the help of BeautifulSoup. **(6)**

   c) Write a short note on python urllib3 query parameters with a code snippet. **(6)**

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G 506.5a

St Aloysius College (Autonomous)
Mangaluru
B.Sc. - Semester V
DECEMBER - 2022
STATISTICS - Paper V
DESIGNS OF EXPERIMENT

Time: 3 Hours.   Max Marks: 100

Note: Answer all parts

PART – A

I. **Answer any <u>TWELVE</u> of the following:**   (2x12=24)

1. State the basic assumptions under ANOVA.

2. Compare ANOVA with t test.

3. State Cochrans Theorem.

4. Distinguish between One way and Two way ANOVA.

5. What is the model for Two way ANOVA? Explain the parameters.

6. Give a t- statistic for pairwise testing of treatments in Two-way ANOVA.

7. Distinguish between blocks and treatments.

8. What do you mean by Layout of the design?

9. Distinguish between conjugate and self conjugate LSD.

10. State any two advantages of RBD.

11. Give a practical example for the application of CRD.

12. Give an expression for estimating one missing observation in case of LSD.

13. Identify a situation for the application of 2^3 factorial experiment.

14. What are the advantages of Factorial Experiments.

15. Define main effect in Factorial Experiment. State an expression for Main effect of A under 2^2 factorial experiment.

PART – B

II. **Answer any <u>SIX</u> of the following.**   (6x6=36)

16. Obtain an expression for expected sum of squares of treatments (or a factor A) under One way Classified Data.

17. Obtain least square estimates of the parameters of Two Way Classified Data model.

18. Explain Three-way classified data with an example. Give the model for three way classified data and explain the components.

19. Explain the principles of Designs of Experiments.

20. Derive an expression for expected value of sum of squares due to Errors in case of CRD.

21. Deduce an expression for estimating one missing observation in case of L.S.D.

22. Briefly explain the layout of R.B.D

23. Obtain expressions for main effects A and B under 2^2 factorial experiment.

24. Describe Yate's method of computing factorial effects totals in a 2^3 factorial experiment.

PART – C

III. Answer any FOUR of the following.   **(10x4=40)**

25. Illustrate the technique of ANOVA for one-way classification, stating the breakdown of the total sum of squares, their distributions and the hypothesis that are usually tested. Also write down the ANOVA Table.

26. Stating the assumptions, derive the expected sum of squares due to error in Three way Classified data.

27. Derive expressions for estimating two missing observation in case of R.B.D and give the ANOVA Table.

28. Latin Square Design is more efficient than Randomized Block Design. Justify.

29. State one practical application of 2^3 factorial experiment and how do you carry on with the analysis?

30. What is a treatment contrast? When two such contrasts are said to be orthogonal? Show that in 2^3 experiment main effect B and an interaction effects BC, ABC are mutually orthogonal.

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G 506.5b

PART – A

I. Answer any **TWELVE** of the following:
(2x12=24)

1. Define the term quality in statistical quality control.
2. Explain i) Control Limits   ii) Warning limits
3. Define defect and defective.
4. Explain rational subgroups.
5. Write any two advantages of TQM.
6. Define PR and CR.
7. Briefly explain specification limits with an example.
8. Is it possible that a process may not be under control when all the sample points are within the control limits in a control chart? If not why?
9. Explain single sampling plan by variable when lower specification L is given
10. Briefly explain rectification inspection procedure.
11. Which probability distribution can be used to model the number of non-conformities and why?
12. Distinguish between natural tolerance limits and control limits.
13. How is the choice between p and np chart made.
14. Define ASN and ATI.
15. Explain SSP by variables when lower specification is given and standard deviation is known.

PART – B

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

16. Explain the terms assignable causes and chance causes of variations in SQC
17. Explain the concept of double sampling plan.
18. When do you use modified control limits? How do you obtain them?
19. Make a comparative study of control charts for variables and attributes.
20. Explain the concept of TQM.
21. Explain probability limits and warning limits.
22. Explain the concept of modified control limits of $\bar{X}$ charts
23. Explain the meaning of an operating characteristic function. Also locate 5 important points on the OC curve.
24. Explain the AOQ of a single sampling plan for attributes. Also derive an expression for AOQ.

PART – C

III. Answer any **FOUR** of the following.
(10x4=40)

25. Explain the various steps in the construction of $\bar{X} - R$ chart.
26. Explain the elements of TQM.
27. Explain the various methods of construction and analysis of p-chart.
28. Distinguish between c and u chart. Also explain the construction and analysis of these charts.
29. a) State the characteristics of OC curve. **(5)**
    b) State the applications of acceptance sampling plan. **(5)**
30. Derive an expression for n and k variables with unknown standard deviation and specified upper specification limit.

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St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V– Degree Examination
December - 2022
BOTANY – PAPER V
PLANT ECOLOGY AND SUSTAINABLE DEVELOPMENT

Time: 3 Hours.   Max Marks: 100

Note: i) Answer all the sections.
       ii) Draw diagrams wherever necessary.

SECTION –A

I   Answer any <u>TEN</u> of the following.   (10X2=20)

1) Mention three types of ecological pyramids.
2) Comment on Genetic Diversity with a suitable example.
3) What does species richness mean?
4) What is remote sensing? Give one example.
5) What are hydrophytes? Give one example of rooted emergent hydrophyte.
6) What is velamen tissue? Mention its function.
7) Which group of mesophytes exhibit radial and tetrarch vascular bundles?
8) What is Hydrosere?
9) Mention new sources of energy.
10) What are endemic plants? Mention any two of them with their botanical names.
11) Cite two major river systems of India.
12) Name the stages involved in Wastewater treatment.

SECTION – B

II   Answer any <u>SIX</u> of the following.   (6x5=30)

1) Comment on different components of Biodiversity with suitable examples.
2) Describe the Pyramid of Biomass and the Pyramid of numbers in forest ecosystem.
3) What is remote sensing? Comment on its applications.
4) Compare morphological adaptations of *Hydrilla* and *Typha.*
5) What are epiphytes? Comment on their morphological adaptions.
6) Describe any five stages of ecological succession.
7) Illustrate the sustainable waste management of e-waste and agricultural waste.
8) Comment on recycling and composting with appropriate examples.
9) Discuss the problems and benefits of River diversion.

SECTION – C

III Answer any <u>FIVE</u> of the following.   (5x10=50)

1) Identify different terrestrial ecosystems and write about species composition, stratification, and nutrient cycling in these ecosystems.
2) Elaborate on tools and techniques used in remote sensing.
3) With the help of a neat, labelled sketch, explain the pond ecosystem with its various components.
4) Explain Xerosere in detail.
5) Provide a classification of different ecological groups of plants with two suitable examples each and explain the morphological adaptations of Halophytes.
6) Discuss anatomical adaptations of Hydrophytes and Xerophytes in detail.
7) Write an account of Watershed Conservation Practices.
8) Discuss India's energy issues and potential solutions.
9) Explain the process of water treatment in detail.

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G507.5b   Reg. No.: ☐☐☐☐☐☐☐

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December - 2022
BOTANY – Paper VI
CYTOGENETICS AND MOLECULAR BIOLOGY

Time: 3 Hours.   Max Marks: 100

Note: i) Answer all the sections.
      ii) Draw diagrams wherever necessary.

SECTION –A

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

1) State Wobble Hypothesis.
2) 'Genetic code is Degenerate' Comment on this.
3) What are Okazaki Fragments? Mention its significance.
4) Differentiate between Euchromatin and Heterochromatin.
5) State Mendel's Law of Segregation.
6) What is crossing over? Mention the types.
7) Recessive back cross is test cross. Give reason.
8) What is incomplete dominance? What is the ratio obtained?
9) Define Frame shift mutations.
10) What is Nullisomy? Mention its significance.
11) What is transition? Mention its significance.
12) What is Proteomics?

SECTION – B

II   **Answer any SIX of the following.**   (6x5=30)

1) Explain the Lac –Operon model of gene regulation
2) Describe : i) Non- sense codons ii) Synaptonemal complex
   iii) Monocistronic genes   iv)Solenoid v) Transposons
3) Mention the significance of different enzymes in DNA replication.
4) What is gene interaction? Explain Supplementary factors with an example.
5) What is Monohybrid cross? State and explain the law of purity of gametes.
6) Explain Incomplete linkage with a plant example
7) Define i) Tautomerization ii) Germinal Mutations iii) Autotriploidy
    iv) Translocations v) Monosomy
8) Give a detailed account on the types and effects of chemical mutagens.
9) Briefly explain the Gene controlled mechanism in Maize.

SECTION – C

III   **Answer any FIVE of the following.**   (5x10=50)

1) Explain Mitosis with neat labeled diagram.
2) With a neat labeled diagram explain Watson and Crick model of DNA.
3) Explain the process of mRNA biosynthesis in Prokaryotes.
4) Describe Double Recessive Epistasis with a plant example.
5) Comment on : i) Self sterility in *Nicotiana*   ii) Phenotypic ratio 9:6:1
6) What is Duplicate Gene Action? Explain it in the fruit shape of Shepherd's Purse.
7) Write a note on i) Pericentric inversion ii) Chromosomal deletions.
8) Write a short on i) Point Mutation ii) Lethal Mutations.
9) Write a note on i)*Triticale* ii) *Raphanobrassica* iii) Trisomy in *Datura*

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G 508.5a   Reg. No.: ⬚⬚⬚⬚⬚⬚

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December - 2022
ZOOLOGY – Paper V
HISTOLOGY, REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY

Time: 3 hrs.   Max Marks: 100

Note: 1. Answer all questions.   2. Draw diagrams wherever necessary.

PART –A

I. Answer any <u>TEN</u> of the following.   (2X10=20)

a)   What are Leydig cells? Mention their functions.

b)   What is differential staining?

c)   Write the histological differences between PCT and DCT of Nephron

d)   What is spermiogenesis?

e)   Define metagenesis. Give an example.

f)   Write the significances of fertilization.

g)   Enumerate any four branches of embryology.

h)   What is mesogenesis?

i)   Define cleavage. What type of cleavage is observed in frog?

j)   Name any two placental hormones.

k)   What is embryo splitting?

l)   What is implantation?

PART – B

Select ONE full question from each unit

UNIT-I

II. a) Explain the Histology of mammalian liver.   (10 Marks)

     b) With reference to microtomy, explain section cutting.   (5 Marks)

     c) Draw a neat labeled diagram of T.S. of mammalian thyroid gland.
                                                                   (5 Marks)

OR

III. a) Explain double staining technique.   (10 Marks)

     b) Write a note on Islets of Langerhans.   (5 Marks)

     c) Explain briefly the T.S. of Intestine of a mammal.   (5 Marks)

UNIT-II

IV. a) Give an account on temporary method of family planning.   (10 Marks)

     b) Explain cyclic parthenogenesis with an example.   (5 Marks)

     c) Write a note on previtellogenesis.   (5 Marks)

OR

V.   a) With reference to fertilization, explain
         1) Acrosome reaction   2) Cortical reaction.   (10 Marks)

     b. Draw a neat labeled diagram of reproductive system of human female.
                                                                   (5 Marks)

     c. What is estrous cycle? Explain.   (5 Marks)

UNIT-III

VI. a) Explain gastrulation in frog with suitable diagrams. **(10 Marks)**

b) Write the functions of allantois and yolk sac. **(5 Marks)**

c) Explain any two theories of development. **(5 Marks)**

OR

VII. a) Explain the structure of 18 hours chick embryo with a labeled diagram.

(10 Marks)

b) Explain the structure and functions of amnion. **(5 Marks)**

c) Draw a neat labeled diagram showing fate map of blastula of frog.

(5 Marks)

UNIT-IV

VIII.a) Explain the structure of Graafian follicle with a neat labeled diagram.

(10 Marks)

b) Explain haemochorial placenta. Give two examples. **(5 Marks)**

c) Write a short note on superovulation. **(5 Marks)**

OR

IX. a) Explain Spemann's experiment with suitable illustrations. **(10 Marks)**

b) Enumerate the functions of placenta. **(5 Marks)**

c) Explain the structure of blastocyst in humans. **(5 Marks)**

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PART –A

I. Answer any <u>TEN</u> of the following.   (2X10=20)

a) Define the term mutualism with an example.

b) What is biosphere?

c) Explain food web.

d) Classify freshwater ecosystem with examples.

e) What is Climax community?

f) Differentiate natality from mortality.

g) What is photochemical smog?

h) What are bioindicators? Give examples.

i) Give the formula to calculate mean and median.

j) Define Wallace line.

k) Comment on tropical rain forests.

l) What are endangered species? Give two examples.

PART – B
Select ONE full question from each unit

UNIT-I

II.   a) Give a detailed account on effect of light on animals.   (10 Marks)

      b) Explain man engineered ecosystem with suitable example.   (5 Marks)

      c) Write a short note on pyramids of number.   (5 Marks)

OR

III. a) Explain types of food chain with suitable examples.   (10 Marks)

      b) Give a brief account on cyclomorphosis.   (5 Marks)

      c) Explain predation with suitable examples.   (5 Marks)

UNIT-II

IV.   a) With a suitable illustration, explain zonation of sea.   (10 Marks)

      b) Explain about ecological niche with examples.   (5 Marks)

      c) Comment on biotic potential.   (5 Marks)

OR

V.   a) With reference to population ecology, explain population growth curves.
                                                                       (10 Marks)

      b) Explain ecological stratification.   (5 Marks)

      c) Give an explanatory note on mangroves.   (5 Marks)

UNIT-III

VI. a) Give a detailed account of graphical representation of Data. **(10 Marks)**

b) Calculate standard deviation of the following data. **(5 Marks)**

3, 5, 6, 4, 6,8

c) Comment on eutrophication. **(5 Marks)**

OR

VII. a) Give an explanatory note on 1) greenhouse effect 2) tsunami. **(10 Marks)**

b) Explain Shelford's Laws of limiting factors. **(5 Marks)**

c) Prepare a histogram of following data

Fish wt (in gms)	250	350	500	100
Number of fish	10	20	15	30

(5 Marks)

UNIT-IV

VIII. a) Give an account on climatic conditions and characteristic fauna of Oriental realm. **(10 Marks)**

b) Explain the concept of biodiversity hotspot with suitable examples.

(5 Marks)

c) What is human animal conflict? Explain **(5 Marks)**

OR

IX. a) Write an explanatory notes on 1) Project tiger 2) Red data book.

(10 Marks)

b) Comment on the distribution of wildlife in Andaman and Nicobar islands.

(5 Marks)

c) Give a note on Wildlife (protection) act 1972. **(5 Marks)**

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G 509.5a   Reg. No.:

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December - 2022
MICROBIOLOGY – PAPER V
MEDICAL MICROBIOLOGY & IMMUNOLOGY

Time: 3 Hours.   Max Marks: 100

Instructions: Answer PART A AND B AND C
        Draw Diagrams wherever necessary.

PART – A

1. **Define/Answer any <u>TEN</u> of the following:**   (2x10=20)
  a) Epitope
  b) Coagulase
  c) Virulence
  d) Passive Immunity
  e) Nosocomial Infection
  f) Haptens
  g) Toxic Shock Syndrome
  h) Cellular immune response
  i) Macrophages
  j) Tetanus
  k) Interferons
  l) Toxoid vaccine

PART – B
Answer 'a' or 'b' and 'c' is compulsory from each unit.   (15x4=60)
UNIT -I
2. a) Describe the types of immunity.   (9)
OR
  b) Describe the factors predisposing to microbial pathogenicity.

  c) Write a note on factors influencing innate immunity.   (6)
UNIT -II
3. a) Describe the different classes of immunoglobulins.   (9)
OR
  b) Describe the structure of immunoglobulin molecule.

  c) Write a note on specificity of antigen.   (6)
UNIT –III
4. a) Explain the structure and function of bone marrow.   (9)
OR
  b) Explain the process of humoral immune response.

  c) Write a note on monoclonal antibodies.   (6)
UNIT –IV
5. a) Describe the pathogenesis of enteric fever.   (9)
OR
  b) Describe the laboratory diagnosis of infections caused by *Shigella*.

  c) Write a note on the types of vaccines.   (6)
PART – C
Answer any <u>FOUR</u> of the following.   (5x4=20)
6. a) Kirby Bauer method.
  b) Classification of infections.
  c) Spleen.
  d) T cells.
  e) Mechanism of drug resistance.
  f) Classification of antibiotics.

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G 509.5b

Reg. No.:

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
December – 2022
MICROBIOLOGY – PAPER VI
PLANT MICROBIOLOGY AND BIOREMEDIATION

Time: 3 Hours.   Max Marks: 100

Instructions: Answer PART A AND B AND C
            Draw Diagrams wherever necessary.

PART – A

1. **Define/Answer any TEN of the following:**   (2x10=20)
   a) Azospirillum
   b) Flavonoids
   c) PCBs
   d) Amylases
   e) Fungal antagonists
   f) HC toxin
   g) Water activity
   h) Composting
   i) Hemicelluloses
   j) Bacteria mediated frost injury
   k) Tentoxin
   l) Intrinsic bioremediation

PART – B
Answer 'a' or 'b' and 'c' is compulsory from each unit.   (15x4=60)
UNIT -I
2. a) Explain in detail about Azolla biofertilizer.   (9)
   OR
   b) Explain in detail about Rhizobium biofertilizer.
   c) Write briefly on biological control of diseases of aerial plant parts with   (6)
      bacteria.

UNIT –II
3. a) Explain in detail about Koleroga in arecanut.   (9)
   OR
   b) Explain in detail about Sandal spike disease.
   c) Write a short note on development of disease in plants.   (6)

UNIT -III
4. a) Discuss persistence and biomagnification.   (9)
   OR
   b) Explain the strategies for bioremediation.
   c) Write briefly on environmental factors affecting biodegradation   (6)

UNIT –IV
5. a) Explain in detail the microbiology of cellulose degradation.   (9)
   OR
   b) Explain in detail the microbiology of lignin degradation.
   c) Write briefly about effects of residues of crops on plant growth. (6)

PART – C
Answer any FOUR of the following.   (5x4=20)

6. a) Phosphate solubilizing microorganisms as biofertilizer
   b) Host specific toxins
   c) Azotobacter biofertilizer
   d) Tikka disease of groundnut
   e) Phytoremediation
   f) Green manure

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G 510.5a   Reg. No.: ☐☐☐☐☐☐

St. Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V - Degree Examination
December - 2022
BIOCHEMISTRY – Paper V
MOLECULAR BIOLOGY

Time: 3 Hours   **Max. Marks: 100**

Note: i) Answer all the questions
      ii) Draw diagrams wherever necessary

PART – A

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

   a) What are Okazaki fragments?

   b) What is T_m?

   c) What are introns and exons?

   d) What are ribozymes? Mentions its functions.

   e) Define Chargaff's rule.

   f) What is Polyadenylation and mention the enzymes involved in it?

   g) Define Wobble hypothesis.

   h) What is the significance of thymidine in DNA?

   i) What are non-sense codons? Give examples.

   j) Write the effect of alkylating agent as a mutagen.

   k) What are promoters?

   l) Write the role of puromycin as translational inhibitors.

PART – B
Answer any SIX of the following.   (5x6=30)

2. Write a note on Holliday model.

3. Explain the structure of t-RNA.

4. Explain the Meselson and Stahl experiment.

5. Explain the splicing mechanism.

6. Explain the Lac operon and its regulation.

7. Explain the DNA repair mechanism.

8. Explain the structure of eukaryotic chromosome.

9. Write a note on eukaryotic post translational modification by glycosylation.

PART - C
Answer any FIVE of the following: (10x5=50)

10. Explain the mechanism of gene transfer by conjugation and transformations in bacteria.

11. Explain the prokaryotic transcription.

12. Write the general features of genetic code.

13. Explain on Hyperchromicity of DNA and C_0t curve.

14. Define mutation. Explain various types of mutations with examples.

15. Explain the mechanism of DNA replication.

16. Explain the mechanism of translation in prokaryotes.

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G 510.5b

Reg. No. :

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V - Degree Examination
December - 2022
BIOCHEMISTRY – Paper VI
GENETIC ENGINEERING AND BIOTECHNOLOGY

Time: 3 Hours   Max. Marks: 100

Note: i) Answer all the questions
      ii) Draw diagrams wherever necessary

PART – A

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

   a) What are Restriction endonucleases? Give examples.

   b) Discuss the importance of gelling agents in tissue culture.

   c) What are Cybrids?

   d) What is a primary metabolite?

   e) Enlist the characteristics of pUC 19.

   f) What are explants?

   g) Briefly discuss the ethical issues faced in biotechnology.

   h) What are the steps involved in cheese production?

   i) What are the applications of protoplast culture?

   j) What is continuous culture fermentation?

   k) What are cryoprotectants? Mention their types.

   l) Write the principle of Southern blotting technique

PART – B

Answer any **SIX** of the following.   (5x6=30)

2. Explain the role of micro, macronutrients in plant tissue culture.

3. Discuss the principle and application on western blotting.

4. Write a note on Edible vaccines.

5. Write a note on Secondary metabolites.

6. Explain the methods involved in germplasm conservation.

7. Write a note on the production of single-cell proteins.

8. Write a short note on CRISPR-Cas 9 gene editing.

9. Explain the steps involved in DNA cloning.

PART - C

Answer any **FIVE** of the following: (10x5=50)

10. Discuss the applications of Genetic engineering in agriculture and medicine.

11. Discuss the methods used for protoplast isolation and culture.

12. Explain the method for the production of penicillin and tetracycline.

13. Discuss the principle and applications of polymerase chain reaction.

14. Explain the general steps involved in micropropagation technique.

15. Explain the method for *Agrobacterium*-mediated gene transfer.

16. Explain the design of a chemostat and method for the production of Wine.

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G 511.5a   Reg. No:

St Aloysius College (Autonomous) Mangaluru

B.Sc. Semester V – Degree Examination
December - 2022
BIOTECHNOLOGY – PAPER V
PLANT BIOTECHNOLOGY

Time: 3 Hours   Max. Marks: 100

Note: i) Answer all the questions
      ii) Draw diagrams wherever necessary

PART - A

1. **Answer any <u>TEN</u> of the following.**   (10×2=20)
   a) What is Bergman's plating technique?
   b) What are cybrids?
   c) Comment on important components of MS Media.
   d) What is cytodifferentiation?
   e) Define electroporation
   f) Comment on the application of synthetic seeds
   g) Write the application of meristem culture
   h) What is the application of somaclonal variants?
   i) What is suspension culture?
   j) Define micropropogation
   k) Define Gynogenesis
   l) What is Bt cotton?

PART-B

Answer any <u>SIX</u> of the following   (6×5=30)

2. Comment on *invitro* conservation of germplasm

3. Explain somatic embryogenesis and different stages of somatic embryo development

4. Describe various protoplast viability test

5. Explain the structure of Ti plasmid and vectors based on it

6. Comment on the use of plant growth regulators in tissue culture

7. Explain about direct and indirect androgenesis

8. Discuss about secondary metabolite production and problems associated with it

9. Explain the different techniques employed in the sterilization of culture media

10. Discuss about soma clonal variations

PART – C

Answer any <u>FIVE</u> of the following.   (5×10=50)

11. Discuss about different techniques employed in the production of virus free plants

12. Explain cell suspension culture and its application

13. Discuss about somatic hybridisation

14. Explain the mechanism involved in the production of Golden Rice.

15. Comment on the design of plant tissue culture laboratory

16. Give a detailed account on applications and limitations of micropropogation

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G 511.5b

Time: 3 Hours

Max. Marks: 100

Note: i) Answer all the questions
ii) Draw diagrams wherever necessary

PART - A

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

   a) What is dye exclusion method?

   b) Name two enzymes used in disaggregation of animal tissues

   c) Mention two cryoprotectants used in cell culture

   d) Name two disadvantages of using serum in culture media

   e) Differentiate between cell line and cell strain

   f) What is plasma clot technique?

   g) Name two methods used in cell fusion

   h) Mention two microcarriers used in microencapsulation method

   i) Name two functions of human growth hormone

   j) What are two uses of transgenic fish

   k) What is Xenotransplantation?

   l) Differentiate between totipotent and pluripotent stem cells

PART-B

Answer any **SIX** of the following   (6×5=30)

2. Give an account on somatic cell nuclear transfer

3. Describe working of Air-lift fermentors

4. Elaborate on history of animal cell culture

5. Explain grid and raft methods of organ culture

6. Describe thymidine incorporation assay

7. Write short notes on stem cell

8. Give an account on somatic gene therapy

9. Describe various banding techniques

10. Write short notes on immunostaining

PART – C

Answer any **FIVE** of the following.   (5×10=50)

11. Describe the production of monoclonal antibodies. Mention its applications

12. Give an account on essential equipments used in animal cell culture laboratory

13. Explain the production of alpha antitrypsin in mammary glands of sheep

14. Describe the various types of monolayer cultures

15. Give a detailed account on primary explant technique

16. Explain the production of human insulin using rDNA technology

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St Aloysius College (Autonomous)
Mangaluru
B.A./B.Sc. Semester V – Degree Examination
December - 2022

COMPUTER ANIMATION – PAPER V
3D TEXTURING, CAMERA & LIGHTING

Time: 3 hrs.   Max Marks: 100

PART - A

Answer any TEN of the following.   (10x2=20)

1. a) How to increase the frames in timeline?

   b) How to use hair & fur modifier?

   c) Which files we can import to projector map?

   d) What is the default color and intensity of Spot light?

   e) How to create small bulbs in 3D scene?

   f) How to create the transparent object?

   g) What is the use of bump map?

   h) What is the color temperature & hue value of sunset?

   i) Name the lens effects.

   j) What is the role of intensity under lights?

   k) Name the Photometric lights.

   l) What is the use of specular level and glossiness?

PART - B

Answer any FOUR of the following.   (4x5=20)

2. Explain the steps to create a golden trophy.

3. Write a note on cameras in 3D.

4. Explain 2 Types of lights.

5. What is the use of bump and gradient texture?

6. Write a note on reflection and refraction.

PART – C

Answer any TWO of the following: (2x10=20)

7. What are the Properties of lights?

8. Explain any 5 different types of mapping

9. Explain different types of material shaders.

PART - D

Answer any TWO of the following: (2x20=40)

10. Write down the steps to create a product bottle and Rubik cube.

11. Explain briefly about Hair and Fur modifier.

12. Write a note on UVW & unwrap UVW modifier.

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St Aloysius College (Autonomous)
Mangaluru
B.Sc. - Semester V – Degree Examination
December - 2022
ECONOMICS – Paper V
DEVELOPMENT ECONOMICS

Time: 3 hrs.   Max Marks: 100

PART - A

Answer any FOUR of the following questions in about 10 sentences each.   (4×5=20)

1. Calculate HDI using data table given below.

Life Expectancy at Birth	73.7
Expected Years of Schooling	13.9
Mean Years of Schooling	9.5
Gross National Income	6309 $

2. What is indivisibility of demand?

3. Write a note on NPV & SPP.

4. Briefly explain the concept of disguised unemployment.

5. Write a note on agriculture and economic development.

6. What are the pre-requisites for economic planning?

PART – B

Answer any FOUR of the following questions in about 20 sentences each.   (4×10=40)

7. Calculate GDI using following table

Indicator	Female	Male
Life Expectancy at Birth (Years)	75.1	72.7
Expected Years of Schooling (Years)	12.5	17.2
Mean Years of Schooling (Years)	12	13.53
Wage Ratio(female/male)	0.6257	
Gross National Income (2011 PPP $)	27,986	
Share of economically active population	0.4322	0.5678
Share of population	0.51166	0.48834

8. Briefly explain unbalanced growth theory of economic development.

9. Explain the role of technology in economic development.

10. Explain Lewis theory of unlimited supply of labour.

11. Explain the role of industrialisation in economic development.

12. Briefly explain planning by direction and planning by inducement.

PART – C

Answer any TWO of the following questions in about 50 to 60 sentences each.   (2×20=40)

13. Explain the Rostow's stages of economic growth.

14. What is capital formation? Explain the various sources of capital formation.

15. Explain Nurkse's theory of disguised unemployment. What are its criticisms?

16. What is sustainable agriculture? Explain different techniques of sustainable agriculture.

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PART - A
Answer any FOUR of the following questions.   (4×5=20)

1. Explain the concept of break-even analysis.

2. The demand for a certain commodity found to be   D=100-2P
   a) What is the demand if the price is Rs.10?
   b) What should be the price if the seller wants to sell 80 units?
   c) What is the largest quantity that one can sell?
   d) What is the maximum price he can charge for the commodity?
   e) Graph the demand curve.

3. Calculate the maturity value of a deposit of Rs 50,000 deposited for a period of 5 years with an interest of 8% per annum if
   a)   Interest rate is compounded annually.
   b)   Interest rate is compounded biannually.

4. A Company has a total cost function represented by the equation
   $Y = 2x^3 – 3x^2 – 12x$, where y represents cost and x represents quantity.
   a) What equation represents the marginal cost function?
   b) What is the equation for the average cost function?
   c) At what point is average cost at its minimum?

5. If the marginal revenue is $MR = 20 – 3x^2$, find the total revenue and demand functions.

6. Find the inverse of the matrix $A = \begin{bmatrix} 3 & 1 \\ 2 & 4 \end{bmatrix}$

PART – B
Answer any FOUR of the following questions.   (4×10=40)

7. In a two sector economy $C=48+0.8Y$, $I= 98-75i$, $M_s=250$, $M_t= 0.3Y$ and $M_r= 52-150i$.
   Where C is consumption function, I is investment function, M_s is supply of money, i is rate of interest, M_t is demand for money for transactions and precautionary motive, M_r is speculative demand for money. Determine the equilibrium in commodity and money markets.

8. For the following pair of demand and supply equations determine the Market Equilibrium quantity and price algebraically:
   $S= -6+ P$ $D =18-2 P$

9. Pragathi corporation has Rs. 10,000 to deposit and expects to leave the deposit for 20 years. Two options are available 5% interest payable biannually and 4.5% interest payable quarterly. Which option should Pragathi Corporation choose?

10. If the average cost function is $\overline{Y}_c = 6x + 7 + \dfrac{36}{x}$

   a) What equation represents the total cost function?
   b) What equation represents the marginal cost function?
   b) At what quantity will average cost be minimum?
   c) Prove at what point marginal cost and average cost are equal.

11. Find the profit maximizing output and the total profit at that point if the Marginal Revenue and Marginal Cost functions are given as

$$MR = 15 - 5x$$

$$MC = 10 - 3x + 3x^2$$

12. Obtain the optimum solution for the following Linear Programming problem.

   Maximize: $Z = 45x_1 + 55x_2$

   Subject to constraints:

$$6x_1 + 4x_2 \le 120$$

$$3x_1 + 10x_2 \le 180$$

$$x_1, x_2 \ge 0$$

PART – C

Answer any <u>TWO</u> of the following questions.   **(2×20=40)**

13. The demand and supply function of a certain commodity are S= -6+3P and D = 24-2P.
   a) Find out the equilibrium values of price and quantity.
   b) What happens to equilibrium values when a subsidy of Rs.2 is given?
   c) What is the ioss of revenue to the government?
   d) Determine how the subsidy is shared between the producer and consumer.

14. a) Mention some of the uses of differential calculus in Economics.
   b) The Average Revenue function for a particular commodity is Y = 28 – 5x and the Average Cost to the Monopolist is $\overline{Y}_c = x + 4$.

   Determine the maximum possible profit obtainable by a monopolist.

15. If $TC = -\dfrac{Q^2}{10} + 5Q + 200$
   a) What is the Average cost?
   b) What is the Marginal Cost?
   c) Determine the level of output at which average cost is the minimum.

16. Solve the following simultaneous equations using Cramer's rule
   X+y+2z=5
   2x-4y+3z=6
   3x-3y+z=11

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