

G 501.5a

(2014 Batch Onwards)

Reg. No. :

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

Time: 3 hrs.

Max Marks: 100

SECTION - A

(10×2=20)

1. Answer any **TEN** of the following.

- What is meant by fine structure of spectral lines?
- What is the significance of Stern-Gerlach experiment?
- Give the expression for Bohr magneton and mention its significance
- Can $^2P_{5/2}$ state exist? Give reason
- What are eigen values and eigen functions?
- The wave nature of matter is not significant in our daily life. Give reason
- If kinetic energy of electron doubles, by what factor its de- Broglie wavelength changes?
- What is a normalized wave function?
- Mention the types of spectra of a molecule
- Mention two applications of Raman effect
- Mention the various factors responsible for the total energy of a diatomic molecule
- Give the expression for Compton shift



SECTION B

Answer **TWO** full questions from each unit:

UNIT - I

- Obtain the expression for Zeeman shift using vector atom model (6)
- Explain the fine structure of sodium D lines (4)
- Explain the success and failure of Bohr atom model (6)
 - Explain the splitting up sodium D_2 line in anomalous Zeeman effect (4)
- Obtain the expression for magnetic dipole moment of electron due to orbital motion and spin (6)
 - Explain the essential features of vector atom model (4)

UNIT - II

- Assuming the time dependent Schrodinger wave equation set up time independent Schrodinger wave equation (6)
 - Based on uncertainty principle, prove that an electron cannot exist inside the nucleus of an atom (4)

Contd....2

G 501.5a

- 6.a) State Heisenberg's uncertainty principle. Explain the gamma ray microscope experiment to illustrate the uncertainty principle (6)
- b) Using the eigen values of energy and eigen functions for a particle in a three dimensional box, account for degeneracy (4)
- 7.a) Describe Davisson-Germer experiment and analyze the results obtained in support of de-Broglie's hypothesis of matter waves (6)
- b) What are matter waves? Obtain the expression for de-Broglie wavelength (4)

UNIT – III

- 8.a) Assuming the 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) Explain the characteristics of Raman spectrum (4)
- 9.a) Draw a neat diagram of the experimental arrangement for the study of Raman effect and name the parts. Give the quantum theory of Raman effect (6)
- b) Obtain the expression for rotational energy of a diatomic molecule (4)
- 10.a) Describe the Millikan's oil drop method to determine the charge of electron (6)
- b) Mention the different regions of molecular spectra. Explain the applications of molecular spectra (4)

SECTION – C

Answer any FOUR of the following: (4×5=20)

11. Calculate the magnetic field strength required to produce a normal Zeeman shift of 0.05nm of the line of wavelength 600nm if specific charge of electron $\frac{e}{m}$ is $1.76 \times 10^{11} \text{C/kg}$
12. The experimental value of Bohr magneton is 9.21×10^{-24} SI units. If Planck's constant $h = 6.63 \times 10^{-34} \text{Js}$, Calculate the value of e/m of electron
13. The position and momentum of a 1keV electron are simultaneously determined. If its position is located within 0.1nm, what is the percentage uncertainty in its momentum? Given: Mass of electron = $9.1 \times 10^{-31} \text{kg}$ and charge of electron = $1.6 \times 10^{-19} \text{C}$
14. The energy of a linear harmonic oscillator in its third excited state is 0.1eV. Calculate the frequency of vibration. Also find the zero point energy of the oscillator. Given $h = 6.63 \times 10^{-34} \text{Js}$
15. An oil drop of density 920kgm^{-3} falls freely in air of viscosity $1.824 \times 10^{-5} \text{Nsm}^{-2}$ with uniform velocity of $8.58 \times 10^{-4} \text{ms}^{-1}$. When a vertical electric field of $3.18 \times 10^5 \text{volt/meter}$ is applied, the drop moves at various speeds which differ each other by small multiples of $5.39 \times 10^{-5} \text{ms}^{-1}$. Calculate the value of the electronic charge
16. Find the minimum rotational energy of a CO molecule. Mass of C atom is 12amu, mass of O atom is 16amu, 1amu = $1.66 \times 10^{-27} \text{kg}$ and bond length = 0.15nm

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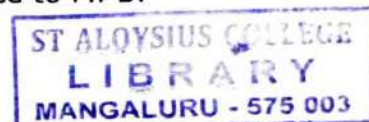
St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V- Degree Examination
February - 2022
PHYSICS-PAPER VI
SOILD STATE PHYSICS

Time: 3 hrs.

Max Marks: 100

SECTION - A

1. Answer any **TEN** of the following. (10×2=20)
- State Dulong-Petit law. Give any one limitation of this law.
 - Distinguish between classical and quantum system of identical particles.
 - What is thermal conductivity? Give the SI units for coefficient of thermal conductivity.
 - Show that at low densities B. E. and F. D. Statistics reduce to M. B. statistics.
 - Define drift velocity. Write the expression for it.
 - What is Hall effect? Give the expression for Hall coefficient.
 - Distinguish between semiconductor and Insulators.
 - What are donor and acceptor levels in an extrinsic semiconductor?
 - Write the lattice parameters for simple cubic crystal system.
 - What are X-rays? How are they produced?
 - Define the terms i) Magnetic susceptibility ii) Magnetic Intensity
 - Define the term electric dipole moment. What is its unit?

**SECTION B**Answer **TWO** full questions from each unit:**UNIT - I**

- What are the assumptions Einstein's theory of specific heat of a solid. (6)
Deduce the expression for specific heat of a solid using these assumptions.
- Show that Einstein's theory reduces to Dulong Petit's law at high temperatures. (4)
- Explain the three distribution laws in Physics. (6)
 - Explain various types of scatterings in a solid. (4)
- Explain the method of determining the coefficient of thermal conductivity of a bad conductor by Lees Charlton method. (6)
 - Give the limitations of Einsteins theory of specific heat. (4)

Contd...2

UNIT – II

- 5.a) What are the causes of electrical resistance in solids? Explain Lorentz-Drude model of a solid and arrive at expression for conductivity. (6)
- b) Explain n-type semiconductor. Draw its energy band diagram. (4)
- 6.a) With necessary diagram explain the method of determining Hall coefficient. What is the significance of Hall Coefficient? (6)
- b) Deduce Ohm's law from the expression for electrical conductivity of a metal. (4)
- 7.a) Explain the formation of bands in solid with an example. (6)
- b) Derive the relation between Fermi energy and mean energy of electrons. (4)

UNIT – III

- 8.a) What are continuous and characteristic X-rays? Explain. (6)
- b) Explain the method of obtaining miller indices for a crystal plane. (4)
- 9.a) What are dielectrics? Discuss the effect of electric field on dielectric materials. (6)
- b) Discuss the domain theory of ferromagnetism. (4)
- 10.a) State Bragg's law and explain Bragg's spectrometer. (6)
- b) Discuss any four crystal systems. (4)

SECTION – C**Answer any FOUR of the following:****(4×5=20)**

11. Calculate Debye temperature of aluminum using the data: $V_l=6370\text{m/s}$, $V_t=3110\text{m/s}$, $N=6.02\times 10^{26}$, $h=6.625\times 10^{-34}\text{JS}$, $K=1.38\times 10^{-23}\text{j/K}$.
12. Assuming that each atom of copper contributes one electron to the free electron gas, find number of electrons per unit volume and the relaxation time. Given, conductivity of copper= $6\times 10^7\text{mho/m}$ its atomic weight 63.54, density= 8960kg/m^3 .
13. Calculate the Fermi energy at Ok for potassium. Given Atomic weight=39, density= 860kg/m^3 , Mass of electron= $9.1\times 10^{-31}\text{kg}$, $h=6.625\times 10^{-34}\text{JS}$, $N=6.02\times 10^{23}/\text{mole}$, charge of electron= $1.6\times 10^{-19}\text{C}$.
14. Resistance of an intrinsic semiconductor at 30°C is 260Ω and at 100°C is 20Ω . Calculate the energy gap.
15. A Crystal plate is mounted on an X-ray spectrometer. The glancing angles of incidence for three reflections are $5^\circ 58'$, $12^\circ 1'$ and $18^\circ 12'$. Show that these are successive orders of reflections from the same crystal plane. Also find the inter planar spacing. The wavelength of the X-ray used is 0.0586nm .
16. A parallel plate capacitor has an area $6.45\times 10^{-4}\text{m}^2$ and the plates are separated by a distance of 2mm , across which a potential of 10V is applied. If a material with dielectric constant 6 is introduced between the plates determine capacitance and polarization.

(2014 to 2019 batch)

G 502.5a

Reg. No.:

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

Time: 3 hrs.

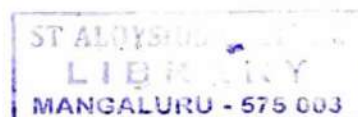
Max Marks: 100

- Instructions:** 1. Write the question number and subdivision clearly.
 2. Write equations and diagrams wherever necessary.
 3. Answer Part – A in first two pages of the answer book.

PART - A

Answer any **TEN** of the following in 1 to 3 sentences. (2×10=20)

1. a) What is van't Hoff factor in the context of abnormal colligative properties?
- b) Define azeotropic mixture. Give an example.
- c) Draw the vapour pressure-composition curve of a binary mixture showing large positive deviation from ideal behaviour.
- d) What are nanocomposites?
- e) What is a redox couple? Give one example.
- f) Give reason: Zinc displaces copper from copper sulphate while copper does not displace zinc from zinc sulphate.
- g) What is masking process? Give an example.
- h) State Beer-Lambert law.
- i) Mention two uses of calcium in biological systems.
- j) Give the reaction for nitration of indole.
- k) Pyridine does not undergo Friedel Crafts reaction. Give reason.
- l) What are heterocyclic compounds? Give an example.

**PART - B**

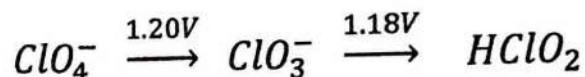
Answer any **TEN** of the following in 3 to 5 sentences. (3×10=30)

2. (i) State Raoult's law. Derive an expression for total vapour pressure of a binary solution.
- (ii) 1.20 g of a non-volatile organic substance was dissolved in 100g of acetone at 20 °C. The vapour pressure of the solution was found to be 182.5 mm of Hg. Calculate the molar mass of the substance (vapour pressure of acetone at 20°C is 185 mm of Hg).
- (iii) Explain the principle of solvent extraction.
- (iv) Describe briefly any three applications of nanomaterials.

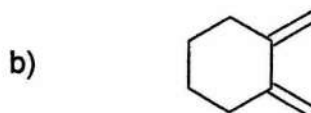
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G 502.5a

- (v) Calculate E° for the reaction $\text{ClO}_4^- \rightarrow \text{HClO}_2$ using the following Latimer diagram.



- (vi) Explain disproportionation using Frost diagram involving NH_3 , NH_2OH and N_2 .
- (vii) Explain Baeyer's process of purification of bauxite.
- (viii) Using Woodward-Fieser rules, calculate λ_{max} for



- (ix) Explain Paal-Knorr synthesis of pyrrole.
- (x) Compare the basicities of pyridine and piperidine.
- (xi) Explain Bohr effect.
- (xii) Give the mechanism for Fiest-Benary synthesis of furan.

PART - C

Answer any **TEN** of the following questions.

(5×10 = 50)

- Give the thermodynamic derivation of the relation between elevation in boiling point and molecular weight of the solute.
- Explain Beckmann's method for the experimental determination of molecular weight.
- What are partially miscible liquids? Explain the concept of critical solution temperature with the help of phenol-water system.
- Describe any one method for the synthesis of carbon nanostructures.
- Explain stability field of water using Pourbaix diagram.
- Explain the estimation of hardness of water by complexometric method.
- What is bathochromic shift? Explain the effect of conjugation on λ_{max} using M.O.T.
- Explain the types of electronic transitions.
- Explain the functioning of sodium-potassium pump.
- Explain the mechanism of conversion of pyridine to 2-aminopyridine.
- Write the reaction for nitration of thiophene. Give the general mechanism.
- How is quinoline synthesized from aniline and glycerol? Explain with mechanism.

(2014 to 2019 batch)

G 502.5b

Reg. No.:

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**St Aloysius College (Autonomous)
Mangaluru**

B.Sc. Semester V – Degree Examination

February - 2022

CHEMISTRY – PAPER VI

Time: 3 hrs.

Max Marks: 100

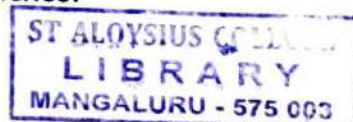
- Instructions:**
1. Write the question number and subdivision clearly.
 2. Write equations and diagrams wherever necessary.
 3. Answer Part- A in the first two pages of the answer book.

PART - A

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

(2×10=20)

1. a) Explain Hamiltonian operator.
b) Give the expression for eigen value E, for the particle in one-dimensional box.
c) Explain why benzene molecule does not show a rotational spectrum.
d) What are allowed and forbidden transitions in rotational spectroscopy?
e) Predict which of the following configurations are expected to have orbital contribution in tetrahedral field.
 d^2 , d^4 , d^8 , d^7
f) State Laporte selection rule in transition metal complexes.
g) Define Curie law.
h) Give any two applications of silicones.
i) Give the Gabriels phthalimide reaction for the preparation of amino acids.
j) What are anomers? Give one example.
k) What is meant by base peak in mass spectroscopy?
l) What are reducing sugars? Give one example.



PART - B

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

(3×10=30)

2. (i) Derive de Broglie equation.
(ii) Derive the Schrodinger equation for a particle moving in one-dimension.
(iii) What is the moment of inertia of a diatomic molecule whose internuclear distance is 140 pm and the reduced mass is 1.5×10^{-27} kg?
(iv) Write a note on isotopic substitution on rotational spectra.
(v) Calculate the magnetic moment of iron in $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ complex using spin only formula.
(vi) Find out the spectroscopic ground state of d^9 configuration.
(vii) Draw and explain Orgel diagram of d^1 configuration of octahedral complex.

Contd...2

G. 502.5b

- (viii) Explain any one method of preparation of Boron nitride.
- (ix) Explain the conversion of glucose to arabinose.
- (x) What is mutarotation? Give its mechanism.
- (xi) Differentiate between secondary and tertiary structures of proteins.
- (xii) Explain McLafferty rearrangement with an example.

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PART - C**Answer any TEN of the following questions.****(5×10 = 50)**

3. What are black body radiations? Explain the effect of temperature on black body radiations.
4. Explain Compton effect. What are the Compton shifts when the incident angles are 0° and 90° ?
5. Derive the expression of rotational energy of a rigid rotor.
6. Show that the successive lines in a rotational spectrum are equally separated.
7. Describe the variation of magnetic susceptibility of paramagnetic, ferromagnetic and antiferromagnetic substances with temperature.
8. How is magnetic susceptibility determined by Guoy's method?
9. Explain the different types of electronic transitions in transition metal complexes.
10. Give any one method of preparation of linear silicones. Give its applications.
11. Explain the mechanism of osazone formation.
12. Outline the conversion of arabinose to glucose.
13. Explain the end group analysis of proteins.
14. How is the configuration of glucose determined?

(2014 Batch onwards)

G 503.5a

Reg. No:

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

MATHEMATICS – Paper V
Algebra, Differential equations and Laplace Transforms

Max. Marks: 100

Time: 3 Hours

Note: Answer all parts

PART – A

(10×2½=25)

Answer any **TEN** of the following.

1. In a ring R , prove that $(-a)(-b) = ab, \forall a, b \in R$.
2. Define integral domain and give an example.
3. Prove that J_p is a field for a prime number 'p'.
4. Prove that every prime element is irreducible.
5. Prove that $g.c.d$ of two elements if exists is unique up to units.
6. Prove that $f(x) = x^2 + x + 1$ is irreducible over the ring of integers modulo 2.
7. Find complementary solution of $(D^3 - D)y = x$.
8. Prove that $\frac{1}{D^2 + a^2} \sin ax = \frac{-x}{2a} \cos ax$.
9. Find particular solution of $(D^2 - 3D + 2)y = 16$.
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 'B' in the method of variation of parameters to solve $(D^2 + 1)y = \cot x$
if $y = A \cos x + B \sin x$.
12. Find a particular solution of $(D^2 + 4)y = \cos 2x$.
13. Find $L\{t^n\}$.
14. Find Laplace transform of $f(t)$, where $f(t) = \begin{cases} 0, & 0 < t < 2 \\ 4, & t > 2 \end{cases}$.
15. Evaluate $L^{-1} \left\{ \frac{2s+1}{s(s+1)} \right\}$.



PART – B
UNIT - I

Answer any **THREE** questions.

(3×5=15)

1. Prove that a finite integral domain is a field.
2. Define simple ring and prove that any field is a simple ring.
3. If 'p' is a prime of the form $4n + 1$ then prove that the congruence $x^2 \equiv -1 \pmod{p}$ has a solution.
4. Let $f: R \rightarrow R'$ be a homomorphism of a ring R onto a ring R' , and let $I = \ker f$ then prove that I is an ideal of R and $R/I \cong R'$.
5. For any ideals I and J , prove that $I + J$ is an ideal in R .

Contd....2

UNIT - II

(3×5=15)

Answer any **THREE** questions.

1. Prove that an ideal P is a prime ideal of \mathbb{Z} if and only if either $P = 0$ or $P = p\mathbb{Z}$ for some prime p .
2. Let R be a commutative ring with 1. Prove that an ideal M is a maximal ideal if and only if R/M is a field.
3. Prove that every prime element is irreducible.
4. Let R be a Euclidean domain and $a, b \in R$. If a is a proper divisor of b then prove that $d(a) < d(b)$.
5. Let R be a commutative ring, and $f(x), g(x) \in R[x]$. Then prove that $\deg(fg) \leq \deg f + \deg g$ and equality holds when R is an integral domain.

UNIT - III

(3×5=15)

Answer any **THREE** questions

1. Solve: $(y'' - 2y' + y) = (1 + e^{-x})^2$.
2. Solve: $(D - 1)^2(D^2 + 1)^2y = e^x + x$.
3. Solve: $y'' + 4y' + 29y = e^{-2x} \sin 5x$.
4. Solve: $(D^2 + 4)y = \cos 2x$.
5. Solve: $(D^3 + 3D^2 + 2D)y = x^2$.

UNIT - IV

(3×5=15)

Answer any **THREE** questions

1. Solve $(D^2 + 1)y = \cot x$ by the method of variation of parameters.
2. Solve the differential equation $\frac{d^2y}{dx^2} + \frac{2}{x} \frac{dy}{dx} + \frac{a^2}{x^4}y = 0$ by the method of change of independent variable.
3. Solve $(1+x)^2y'' + (1+x)y' + y = 4 \cos \log(x+1)$.
4. Solve $(D^2 + 1)y = \operatorname{cosec} x$ by the method of reduction of order.
5. Solve: $x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + y = \frac{1}{(1-x)^2}$.

UNIT - V

(3×5=15)

Answer any **THREE** questions

1. Let $f(t)$ be a periodic function with period ω . Then prove that

$$L\{f(t)\} = \frac{1}{1 - e^{-s\omega}} \int_0^{\omega} e^{-st} f(t) dt.$$
2. If $f(t) = t^2, 0 < t < 2$ and $f(t+2) = f(t)$ then find $L\{f(t)\}$.
3. Find $L^{-1}\left\{\frac{1}{s^2(s+1)^2}\right\}$.
4. Using Laplace transforms solve the differential equation $x''(t) + 4x'(t) + 4x(t) = 4e^{-2t}$ where $x(0) = -1, x'(0) = 4$.
5. Find the Laplace transform of $F(t) = \begin{cases} t^2, & 0 < t < 2 \\ (t-1), & 2 < t < 3 \\ 7, & t > 3 \end{cases}$ using step function.

G 503.5b(i)

Reg. No. :

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

Time: 3 Hours

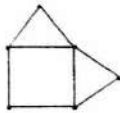
Max. Marks: 100

Note: Answer all parts

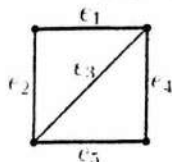
PART – A

Answer any **TEN** of the following: (10×2½=25)

1. If repetitions are allowed, find the number of ways to choose three out of seven days.
2. Define 'language' over an alphabet A and give an example.
3. Define the terms: i) partially ordered set ii) chain
4. Define an 'undirected complete graph' and give an example.
5. Obtain a 2- factor of the following graph.



6. Define a strongly connected graph and give an example.
7. What are information processing machines with and without memory? Give examples.
8. Show that $L = \{a^k | k = i^2, i \geq 1\}$ is not a finite state language.
9. Analyze the time complexity of the algorithm BUBBLESORT.
10. Find the homogeneous solution of the difference equation, $a_r - 2a_{r-1} + a_{r-2} = 0$.
11. Find the forward difference of the numeric function, $\begin{cases} 0, & 0 \leq r \leq 2 \\ 2^{-r} + 5 & r \geq 3 \end{cases}$.
12. Find the numeric function for the generating function $A(Z) = \frac{1}{1+3Z}$.
13. Obtain a binary tree for the prefix code $\{1, 01, 000, 001\}$.
14. Prove that there is a unique path between every two vertices in a tree.
15. List the fundamental cut-sets with respect to a chosen spanning tree of the following graph:



PART – B

UNIT - I

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

1. Explain the phrase structure grammar with examples.
2. Show that any integer composed of 3^n identical digits is divisible by 3^n .
3. Prove that set of all real numbers between 0 and 1 is uncountably infinite.

Contd...2

G 503.5b(i)

4. If the length of the longest chain in a partially ordered set (P, \leq) is ' n ', then show that the elements in P can be partitioned into ' n ' disjoint antichains.
5. Let $T = \{a, b, c, d, +, *, (,), =\}$, $N = \{S, exp, term, factor, id\}$, with S as the starting symbol. Let the productions be
- $$\begin{aligned} S &\rightarrow id = exp \\ exp &\rightarrow exp + term \\ exp &\rightarrow term \\ term &\rightarrow term * factor \\ term &\rightarrow factor \\ factor &\rightarrow (exp) \\ factor &\rightarrow id \\ id &\rightarrow a \\ id &\rightarrow b \\ id &\rightarrow c \\ id &\rightarrow d \end{aligned}$$

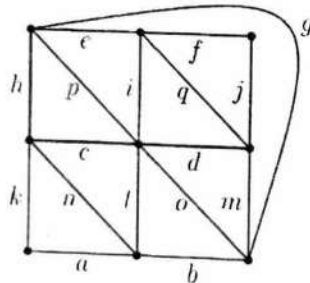
Write down the productions to obtain the sentence $d = (a * b + d * (a + b))$.

UNIT - II

Answer any TWO of the following:

(2×7½=15)

1. Define a 'planar' graph. For any connected planar graph, prove with usual notations that $v - e + r = 2$.
2. Let G be a linear graph with ' n ' vertices. If the sum of degrees of each pair of vertices in G is $n - 1$ or larger, then prove that there exists a Hamiltonian path in G .
3. Define 'Eulerian path' and 'Hamiltonian path'. Trace an Eulerian circuit and a Hamiltonian circuit in the following graph.



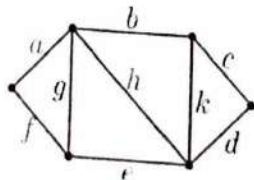
4. Prove that an undirected graph possesses an Eulerian path if and only if it is connected and has either zero or two vertices of odd degree.

UNIT - III

Answer any THREE of the following:

(3×5=15)

1. Prove that every circuit has an even number of edges in common with every cut-set.
2. Prove that a connected graph with $e = v - 1$ edges is a tree.
3. Define a fundamental circuit and find all the fundamental circuits with respect to the spanning tree $T = \{a, g, b, k, c\}$ of the following graph:



G 503.5b(i)

4. For a given spanning tree, let $D = \{e_1, e_2, \dots, e_k\}$ be a fundamental cut-set in which e_1 is a branch and e_2, e_3, \dots, 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, \dots, e_k and that e_1 is not contained in any other fundamental circuit.
5. Describe an algorithm for determining a minimum spanning tree of a connected weighted graph.

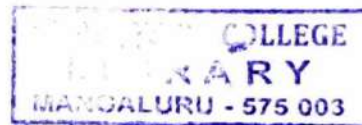
UNIT - IV

Answer any **TWO** of the following:

(2 × 7½ = 15)

1. State the algorithm *LARGEST 1* for finding the largest of the n numbers. Justify it with a formal proof and analyze the time complexity of the algorithm.
2. Show that the language $L = \{a^k b^k \mid k \geq 1\}$ is not a finite state language.
3. State the algorithm *LARGEST 2* used to sort the n numbers stored in n registers. Also justify it with a formal proof.
4. Define equivalent machines. Write the machine equivalent to the following machine and explain the procedure:

State	Input		Output
	1	2	
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. Find the numeric function corresponding to the generating function $A(Z) = \frac{2+3Z-6Z^2}{1-2Z}$.
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, $4a_r - 20a_{r-1} + 17a_{r-2} - 4a_{r-3} = 0$.

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St Aloysius College (Autonomous)

Mangaluru

B.Sc. Semester V – Degree Examination

February -2022

**MATHEMATICS - PAPER VI
GRAPH THEORY**

Time: 3 Hours.

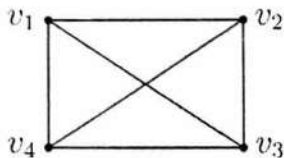
Max Marks: 100

PART -A

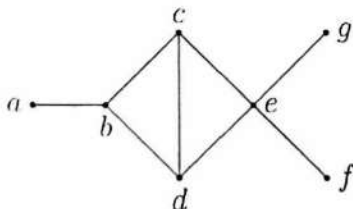
I Answer any TEN of the following:

(10X2½=25)

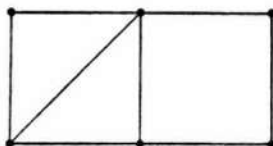
1. Prove that the number of odd degree vertices in a graph is always even.
2. Show that the number of vertices in a binary tree is always odd.
3. Define the terms:
 - i) Spanning tree
 - ii) Binary tree with an example.
4. Write the adjacency matrix of the graph.



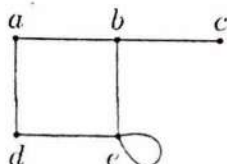
5. Define planar and non-planar graphs with an example.
6. Define cut set matrix of a graph.
7. Find center of the graph



8. Write the vertex connectivity and edge connectivity of



9. Define Euler line in a digraph.
10. Define the terms:
 - i) colouring of a graph
 - ii) Chromatic number of a graph.
11. Write the dual graph of the following:



G 503.5b (iii)

12. Define balanced digraph with an example.
13. Find the graph for which the following is the adjacency matrix.

$$\begin{matrix} & v_1 & v_2 & v_3 & v_4 \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix} \end{matrix}$$

14. Define symmetric and asymmetric digraph.
15. Draw a labeled tree corresponding to the sequence (1, 1, 3, 5, 5, 5, 9).

PART - B

UNIT I

Answer any **THREE** of the following:

(3x5=15)

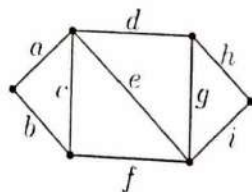
1. Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges.
2. Prove that a tree can have at most two centres.
3. Prove that a connected graph G is an Euler graph if and only if it can be decomposed into circuits.
4. Prove that any connected graph with n vertices and $(n-1)$ edges is a tree.
5. Define Spanning tree and show that every connected graph has atleast one spanning tree.

UNIT II

Answer any **THREE** of the following:

(3x5=15)

1. With respect to a given spanning tree T , prove that a branch b_i , that determines a fundamental cutset S is contained in every fundamental circuit associated with chords in S and in no others.
2. Prove that a graph can be embedded in the surface of a sphere if and only if it can be embedded in a plane.
3. Define fundamental cutset in a connected graph and list all the fundamental cutsets for the following graph with respect to the given spanning tree $T = \{a, c, f, g, h\}$



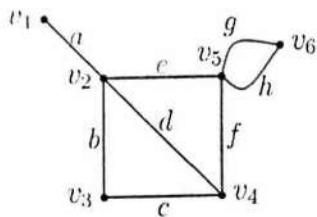
4. Prove that K_5 is nonplanar.
5. Prove that every circuit has an even number of edges in common with any cutset.

UNIT III

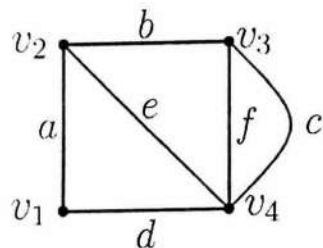
(3x5=15)

Answer any **THREE** of the following:

1. Define path matrix of a graph and write the path matrix for the vertices v_1 and v_5 in the following graph.



2. 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, $AB^T \equiv 0(mod 2)$.
3. If B is a circuit matrix of a connected graph G with n vertices and e edges then Prove that rank of $B = e - n + 1$.
4. Write the circuit matrix of the following graph



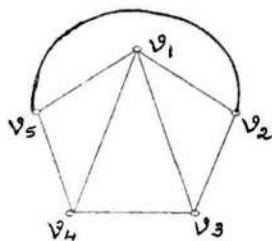
5. If $A(G)$ is the incidence matrix of a connected graph G with n vertices then prove that rank of $A(G) = (n - 1)$.

UNIT IV

(3x5=15)

Answer any **THREE** of the following:

1. Prove that every tree with two or more vertices is 2-chromatic.
2. Find the chromatic polynomial of the following graph



3. Prove that a graph of n vertices is a complete graph if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)(\lambda - 2)...(\lambda - n + 1)$.
4. Prove that a graph of n vertices is a tree if and only if its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$.
5. Prove that a graph with at least one edge is 2-chromatic if and only if it has no circuits of odd length.

UNIT V

Answer any **THREE** 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.

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

3. Prove that a digraph G is an Euler digraph if and only if G is connected and is balanced.
4. Prove that the determinant of every square sub matrix of A , the incidence matrix of a digraph is 1, -1 or 0.
5. Explain the method of construction of directed Euler line in an Euler graph.

G 503.5b(iv)

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

- Define i) Hyperplane in \mathbb{R}^1 ii) Bounded set in \mathbb{R}^n .
- Define a canonical slack maximization L.P.P.
- Pivot on $a_{22} = 5$ in the following maximization table:

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



- Write the matrix reformulation of minimization L.P.P.
- Given the canonical minimization table below, state the corresponding maximization L.P.P.

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

- Define unconstrained variable in a L.P.P.
- State the Von- Neumann Minimax theorem.
- Reduce the table of the matrix game below using domination:

$$\begin{bmatrix} -1 & 1 & -1 & 2 \\ -1 & -1 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$$

- Construct a cycle using circled cells of the following table:

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

- Find all permutation set of zeros of the following table of a balanced assignment problem.

0	0	1
0	0	0
1	0	0

G 503.5b(iv)

11. Define a balanced assignment problem.
12. Explain the process of converting an unbalanced transportation problem to a balanced transportation problem when supply is more than the demand.
13. Define an α - path in a capacitated directed network.
14. Define the cut, cutset and capacity of a cut in a capacitated directed network.
15. Prove that any flow in a capacitated directed network satisfies $\sum_j \phi_j(v) = 0$.

PART - B**UNIT - I****(2x7½ = 15)****Answer any TWO of the following:**

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. State the complete simplex algorithm for the maximum tables.
3. Solve the L.P.P.

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

4. Solve the L.P.P.
 Maximize $f(x, y) = x$
 Subject to : $x + y \leq 1$
 $x - y \geq 1$
 $y - 2x \geq 1$
 $x, y \geq 0$.

UNIT - II**Answer any TWO of the following:****(2x7½ = 15)**

1. Solve: Maximize $f(x, y) = x + 3y$
 Subject to: $x + 2y \leq 10$
 $3x + y \leq 15$
 $x \geq 0$.
2. State the Dual Simplex Algorithm for the minimum table.
3. Solve: Maximize $f(x, y, z) = 2x + y - 2z$
 Subject to: $x + y + z \leq 1$
 $y + 4z = 2$
 $x, y, z \geq 0$.
4. Solve: Minimize $g(x, y, z) = 3x + y + 2z$
 Subject to: $x + 2y + 3z \geq 24$
 $2x + 4y + 3z = 36$
 $x, y, z \geq 0$.

Contd.... 3

UNIT - III

Answer any TWO of the following:

(2x7½ = 15)

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

	x_1	x_2	x_3	-1	
y_1	0	-1	-1	-1	= -0
y_2	-1	-3	4	0	= - t_1
y_3	-1	2	-3	0	= - t_2
-1	-1	0	0	0	= f
	= 0	= s_1	= s_2	= g	

2. Solve the matrix game and find optimal strategies.

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

3. 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	



4. Solve the matrix game and find optimal strategies.

$$\begin{bmatrix} -\frac{5}{3} & 0 \\ 5 & -\frac{10}{3} \end{bmatrix}$$

UNIT- IV

Answer any TWO of the following.

(2x7½ = 15)

1. State VAM in finding the initial basic feasible solution of balanced transportation.
 2. Solve the transportation problem.

	M_1	M_2	M_3	
W_1	2	1	2	40
W_2	9	4	7	60
W_3	1	2	9	10
	40	50	20	

3. State Transportation Algorithm to solve a balanced transportation problem.
 4. Solve the assignment problem below.

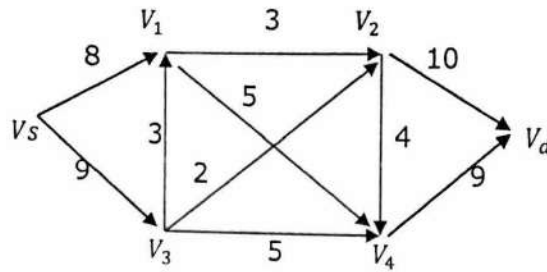
4	6	5	10
10	9	7	13
7	11	8	13
12	13	12	17

UNIT - V

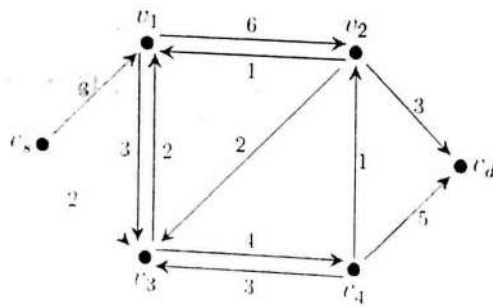
(2x7½ = 15)

Answer any **TWO** of the following:

1. State the Maximal-Flow algorithm.
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.



(2015 Batch onwards)

G 504.5a

Reg. No.

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St Aloysius College (Autonomous)
Mangaluru

B.Sc. Semester V – Degree Examination
February - 2022

ELECTRONICS – PAPER V
Electronic Communication Systems

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

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

- i) Scanning is used to convert _____
 a) optical image to electrical signal b) electrical signal to optical image
 c) both a) and b) d) only (a)
- ii) In the term NTSC, C stands for _____
 a) Color b) committee c) camera d) code
- iii) The difference between the sound and picture carrier frequency of a monochrome TV in CCIR-B system is _____
 a) 4.5MHz b) 6MHz c) 7MHz d) 5.5MHz
- iv) LASCR is a _____
 a) photo emitter b) optical source
 c) optical amplifier d) photo detectors
- v) The loss of energy over a distance in an optical fibre is called _____
 a) attenuation b) Scattering loss c) absorption loss d) dispersion loss
- vi) The duplex distance between uplink and downlink frequencies in GSM900 system is.....
 a)15MHz b)25MHz c)45MHz d) 65MHz
- vii) _____ a digital signal
 a) PAM b) PWM c) PPM d) PCM
- viii) The sharing of a medium and its link by two or more devices is called _____
 a) duplexing b) multiplexing c) microplexing d) full duplexing
- ix) For signal of highest frequency 4kHz, minimum sampling rate should be ____
 a)8000 sample/s b) 2000 sample/s c) 4000 sample/s d) 6000 sample/s
- x) TCP/IP represents _____ in internet
 a) Protocol b) search engine c) Service d) domain



G 504.5a

- xi) Which of the following domains is restricted to qualified organizations?
 a) .com b).org c) .net d).edu
- xii) _____ manages switching function in GSM.
 a) BSS b) NSS c) OSS d) MSC

(10x1=10)

2. Answer any TEN questions.

- i) What is the time taken for tracing one line of a picture content in a frame?
- ii) Give the uplink and downlink frequency range of GSM900.
- iii) What type of deflecting system is used in Picture tube?
- iv) Draw the characteristics of avalanche photo diode.
- v) What is the need of cladding in a fibre?
- vi) Mention the advantage of solid-state relay over mechanical a relay?
- vii) Mention one advantage of digital communication
- viii) Expand the terms a) DSSS and (b) THSS
- ix) State sampling theorem
- x) What is a cell in mobile communication?
- xi) Give the full form of 'MSISDN'
- xii) Differentiate between single mode and multimode fibres.

3. Answer any TEN questions.

(10x2=20)

- i) Mention the advantages of negative modulation.
- ii) Calculate the line scanning frequency in interlaced scanning of CCIR-B system.
- iii) Draw the block diagram of generation of PWM.
- iv) What is a Phototransistor? Write its electrical symbol.
- v) Calculate the numerical aperture of fibre if refractive indices of core and cladding are and 1.5 and 1.485 respectively.
- vi) What is meant Attenuation in optic fiber? Give the equation.
- vii) Determine height and width of a TV screen of 50inch size (aspect ratio=4:3)
- viii) Explain 'frequency reuse' in mobile communication.
- ix) Mention functions of any two subsystems of GSM Architecture.
- x) What is internet protocol? Give one example
- xi) Expand the terms a) IMEI and b) MSI

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

- i) Explain how compatibility is achieved in TV receivers
- ii) For a channel lying in the range (81-88) MHz, determine
 - 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
- iii) Write a note on Interlaced scanning.
- iv) Mention any four materials used in the construction of optical fibre.
- v) write a note on Solar cell
- vi) With Theory, explain the principle of propagation of light through fibre and hence derive the expression for maximum acceptance angle.
- vii) Explain different absorption losses in fibres.
- viii) With diagram explain the detection of PWM signal
- ix) Explain 'cell splitting' and 'cell hand off'
- x) Explain any two internet services.

**SECTION - C****(10x3=30)****Answer any THREE full questions.**

5. a) With diagram, explain progressive scanning Mention its limitation. (6)
- b) With diagram, explain the target plate of Plumbicon camera tube. (4)
6. a) With block diagram, explain an optical communication link (6)
- b) Derive the relationship between Quantum efficiency and Responsivity of a Photo detector. (4)
7. a) With circuit diagram, explain the generation of PWM signal. (6)
- b) Explain the key elements of CDMA (4)
8. a) With block diagram explain GSM architecture (6)
- b) Write a note on FDMA and TDMA (4)

(2015 Batch onwards)

G 504.5b

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St Aloysius College (Autonomous)

Mangaluru

B.Sc. Semester V – Degree Examination

February - 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

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

- i) The Accumulator of 8085 μP is _____ bit.
a) 12 b) 8 c) 16 d) 32
- ii) **MVIA, 18H** in 8085 μP is _____ byte instruction.
a) 3 b) 2 c) 1 d) 4
- iii) **DAD B** instruction of 8085 processor adds the contents of _____ registers.
a) HL and BC b) HL and HL c) HL and SP d) HL and DE
- iv) The size of internal RAM of 8051 μC is _____.
a) 128 bytes b) 4 k bytes c) 512 bytes d) 256 bytes
- v) 8051 μC has -----math flags.
a) 3 b) 4 c) 5 d) 6
- vi) 8051 μC has _____ timers.
a) 2 b) 5 c) 4 d) 1
- vii) _____ instruction is invalid in 8051 μC .
a) MOV R₀, 30H b) MOV R₀, #30H c) MOV R₀, R₁ d) MOV R₀, A
- viii) _____ is the content of PC in 8085 μP after reset key is pressed
a) FFFFH b) 0000H c) F000H d) 8000H
- ix) 8051 controller has _____ interrupts.
a) 4 b) 5 c) 3 d) 7
- x) _____ of 8051 controller does not have dual functions.
a) port 0 b) port 1 c) port 2 d) port 3
- xi) _____ register of 8051 μC is 16 bit
a) A b) SP c) PSW d) PC
- xii) Address bus of 8051 μC is -----bit.
a) 04 b) 08 c) 06 d) 16



Contd...2

G 504.5b**2. Answer any TEN questions.**

- i) Give one example to implied addressing mode in 8085 μ P.
- ii) Which interrupt of 8085 μ C has the highest priority?
- iii) Mention the hardware interrupts of 8085 μ P.
- iv) Give an example for bit addressable SFR in 8051 μ C.
- v) What is the function of SWAP instruction?
- vi) Mention one use of counters in 8051 μ C.
- vii) With example explain INC DPTR instruction of 8051 μ C.
- viii) Write any one 8085 instruction to clear the contents of Accumulator.
- ix) Mention the registers of 8051 μ C used during the execution of MUL instruction.
- x) Mention the difference between ADD R₀ and ADC R₀ instructions in 8051 μ C.
- xi) Write the syntax of DJNZ instruction.
- xii) Mention any one difference between RET and RETI instructions in 8051 μ C.

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

- i) What is meant by a timer? Explain.
- ii) Distinguish between LDA and STA instructions of 8051 μ P.
- iii) With example explain indirect addressing mode of 8051 μ C.
- iv) With an example explain the use of HL as memory pointer in 8085 μ P.
- v) Explain how different register banks are selected in 8051 μ C.
- vi) What are the functions of RS₀ and RS₁ bit of 80518085 μ C?
- vii) Explain the PUSH instruction of 8085 μ P with an example.
- viii) Explain the DIV instruction of 8051 μ C with an example.
- ix) With example explain XOR instruction of 8085 μ P.
- x) Write an 8085 μ P program to double the content of a memory location.
- xi) Explain the IO/ \bar{M} signal of 8085 μ P.
- xii) Mention any two differences between branching and subroutine call in 8051 μ C.

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

- i) With example explain the operation of a subroutine in 8085 μ P.
- ii) With syntax and example explain any two logical instructions of 8051 μ P.
- iii) Explain the following 8085 μ P signals
 - a) \overline{RD}
 - b) $AD_0 - AD_{15}$
 - c) TRAP
 - d) SID

Contd...3

G 504.5b

- iv) Explain any two conditional jump instructions of 8085 μP .
- v) Write any four differences between microcontroller and microprocessor.
- vi) With example explain CJNE command of 8051 μC .
- vii) Write an 8051 μC program to multiply two 8 bit numbers stored in consecutive memory locations. Store the result in next two locations.
- viii) Calculate the delay produced in the case operation of T_0 of 8051 μC timer in mode 1.
- ix) With a block diagram, explain a microcontroller.
- x) Draw the control/logic diagram of timer/counter and explain.



SECTION - C

Answer any **THREE** full questions.

(10x3=30)

- 5. a) With bit pattern explain the flag register of 8085 μP . (5)
- b) With syntax and example explain any two data transfer instructions of 8085 μP . (5)
- 6. a) Explain the organization of internal RAM of 8051 μC . (5)
- b) Write a program to add two bytes of data stored at consecutive external memory locations of 8051 μC . Store the result in suitable memory location. (5)
- 7. a) With example explain how data is stored to and retrieved from stack in 8051 μC . (5)
- b) With bit pattern explain the TMOD register of 8051 μC . (5)
- 8. a) Draw the labeled pin diagram of 8051 μC . (5)
- b) With necessary examples explain any two arithmetic instructions of 8051 μC . (5)

G 505.5a1

(2019-20 Batch)

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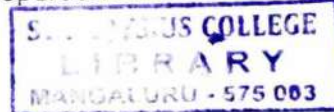
St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
February- 2022
COMPUTER SCIENCE- PAPER V
OPERATING SYSTEM AND LINUX

Time: 3 Hours.

Max Marks: 100

PART – A

1. Answer any **TEN** of the following. (10X2=20)
- Distinguish between symmetric and asymmetric multiprocessor systems.
 - Define the terms a) dispatcher b) dispatch latency.
 - What is PCB? Write the different fields of a PCB.
 - Define context switch.
 - Distinguish between preemptive and non-preemptive scheduling.
 - What is semaphore? Mention the types.
 - Differentiate between CPU bound and I/O bound processes.
 - Write any two techniques used to recover from deadlocks.
 - Define virtual memory.
 - Illustrate the use of is command with examples.
 - Write the different input and output redirection operators used in Linux.
 - Write the use of grep command in Linux.

**PART – B**

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

UNIT - I

- Explain the following: i) Real time systems ii) Time sharing systems (8)
 - Explain the different services of operating system. (6)
 - List and explain the different multithreading models. (6)
- Explain the activities of OS in connection with the following: (8)
 - Main memory management
 - Secondary storage management
 - What is process? Explain the states of a process with a neat diagram. (6)
 - Explain the queuing diagram representation of process scheduling. (6)

UNIT – II

- What is critical section? Explain the requirements of a solution to critical section problem. (8)
 - Explain Round Robin scheduling algorithm with example. (6)
 - Write a note on readers and writers' problem. (6)
- Explain FCFS and SJF scheduling algorithms with example. (8)
 - Explain the two-process solutions to critical section problem. (6)
 - What is meant by CPU scheduling? Explain the different scheduling criteria. (6)

Contd...2

UNIT - III

6. a) Explain the need for page replacement with neat diagram. Given the following page reference string 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1 with 3 frames of memory. Write the steps of FIFO algorithm which shows the occurrence of page fault. (8)
- b) What is deadlock? Explain the necessary conditions for deadlock to occur. (6)
- c) What is deadlock avoidance scheme? Explain Banker's algorithm with necessary data structures. (6)
7. a) Consider the following page reference string with 3 frames of memory 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1. How many page faults would occur for the following replacement algorithm assuming three frames?
i) LRU algorithm
ii) Optimal algorithm. (8)
- b) What is Resource-Allocation Graph? Explain the use of Resource-Allocation Graph in deadlock situations with diagram. (6)
- c) Write a note on deadlock recovery. (6)

UNIT - IV

8. a) Explain while and until looping statements with syntax and example. Also write a shell script to generate first 10 natural numbers. (8)
- b) Explain the following Linux commands with examples. (6)
i) cat ii) chmod iii) mkdir iv) wc
- c) Write a shell script to generate first n Fibonacci numbers. (6)
9. a) Explain the features of Linux and structure of Linux. (8)
- b) Explain different forms of if statements with syntax and example. (6)
- c) Write a shell script to find the sum, difference, product and quotient of given two integers using case statement. (6)

17

G505.5b1

(2019 and 2020 Batch)

Reg. No.:

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St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
February - 2022
COMPUTER SCIENCE – PAPER VI
Python Programming

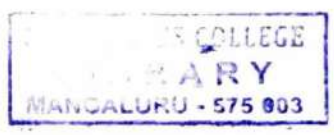
Time: 3 Hours.

Max Marks: 100

PART –A

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

- a) Explain arithmetic operators in python with example.
- b) Suppose a=15, what is the output of
 - i) a>10 ii) not(a>15)
- c) Write the output of x
 - i) x = range(4, 16, 2) ii) x = range(8,10)
- d) Is it possible to access individual characters in a string using -ve integers? Briefly explain with example.
- e) Explain the difference between following if statements in python
 - i) if a > b: print("a is greater than b")
 - ii) if a > b:
 - print("a is greater than b")
- f) When to use list and dictionary during programming?
- g) Briefly explain the working of * and + operators on strings.
- h) What is the difference between "remove" and "pop" in python lists?. Explain with example.
- i) Why type() is used? Explain with example.
- j) List the methods available in Urllib3 for web scraping.
- k) Write a statement in Python to declare a dictionary whose keys are 1, 2, 3 and values are Sun, Mon and Tue respectively.
- l) Give python statements to Check if a set a subset of another set using i) a method i) comparison operator.



PART –B

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

UNIT - I

- 2. a) Write a program to check whether given number is prime or not using a function. Use for loop and break statements. (8)
- b) Explain local and global scope variables. Illustrate with an example. (6)
- c) What is the significance of range function in for loop? Explain with the help of an example. (6)
- 3. a) Write a note on operator precedence in python. Illustrate with an example. (8)
- b) Write a python program to read a string and display part of string using slicing. Give sample outputs. (6)

G 505.5b1

- c) Explain break and continue statements in python with suitable example. (6)

UNIT - II

4. a) Explain List append, insert, remove, reverse, pop operations with example. (8)
- b) Distinguish python lists, tuples and sets. (6)
- c) Write a program to create a list of temperatures in degrees Celsius with the values 25.2, 16.8, 31.4, 23.9, 28, 22.5, and 19.6, and assign it to a variable called temps. (6)
- i) Using one of the list methods, sort temps in ascending order.
- ii) Using slicing, create two new lists, cool_temps and warm_temps, which contain the temperatures below and above 20 degrees celsius, respectively.

5. a) What are the various methods available in set? Explain any five with example. (8)
- b) Differentiate dictionaries vs. lists with example. (6)
- c) How do you implement class and object? Explain with the help of example. (6)

UNIT - III

6. a) Explain following file functions with example. Write possible parameters for the functions. i) open ii) close iii) read iii) write (8)
- b) Write a python function to copy a file, reading and writing up to fifty characters at a time. The first argument is the name of the original file; the second is the name of the new file. (6)
- c) Write a python program to display the contents of a text file. Handle the possible exceptions using exception handling mechanism of python. (6)
7. a) Explain the exception handing mechanism in python. Give suitable example. (8)
- b) Write a python function that a copy a file to another, omitting any lines that begin with #. The first argument is the name of the original file; the second is the name of the new file. (6)
- c) How to save variables of python with i) shelve Module, ii) pprint.pformat() Function. Explain with example. (6)

UNIT - IV

8. a) Using Urllib3 with example explain Making requests, Response content, Request data and Handling exceptions for web scraping. (8)
- b) Write python statements to i) connect an existing database ii) create a table with two attributes ii) insert two tuples into the table. (6)
- c) Briefly explain how to create simple web clients. (6)

9. a) How Beautiful Soup can be used for web scraping? Explain with an example. (8)
- b) Explain how the filtering is achieved through regular expression. Give suitable example. (6)
- c) Explain different ways of retrieving data from databases. Give sample python statements having database queries with example. (6)

(2016 Batch Onwards)

G 506.5a

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St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
February - 2022
STATISTICS - Paper V
DESIGNS OF EXPERIMENT

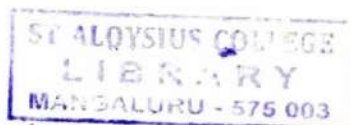
Time: 3 Hours.

Max Marks: 100

Note: Answer all parts

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

1. State the basic assumptions under Gauss Markov Model.
2. Define Critical Difference.
3. Distinguish between Two way and Three way ANOVA.
4. What is Analysis of Variance?
5. Give a t- statistic for pairwise testing of treatments in Two-way ANOVA.
6. What are the limitations of CRD?
7. Define Experiment and uniformity trials.
8. State any two disadvantages of LSD.
9. Give an expression for estimating one missing observation in case of LSD.
10. State the model for CRD and explain the components of the model.
11. What are the degrees of freedom for Sum of Squares due to Error and Total in the analysis of data under LSD when two observations are missing.
12. What is the difference between variability within classes and variability between classes?
13. Explain the necessity of factorial experiments.
14. What are main effects and interaction effects?
15. Distinguish between 2^2 and 2^3 Factorial experiments.

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

16. State the model for One way Classified Data and obtain least square estimates of the parameters of the model.
17. Obtain expected sum of squares due to varieties under Two Way Classified Data.
18. Explain the principles of Designs of Experiments.
19. Derive an expression for expected value of sum of squares due to Treatments in case of RBD.
20. Carry out a comparative study of Randomized Block Design and Latin Square Design with an example.
21. Obtain an expression for estimating one missing observation in case of R.B.D.

Contd...2

G 506.5a

22. Briefly explain Latin Square Design with an example and give the layout of the design.
23. State the model for 2^2 factorial experiment. How do we obtain Factorial effect totals under 2^2 factorial experiment?
24. Obtain expressions for the interaction effects AB and BC under 2^3 factorial experiment.

PART – C

(10x4=40)

III. Answer any **FOUR** of the following.

25. Illustrate the technique of ANOVA for Two-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. State the model for Three way classified data. Deduce an expression for Expected Sum of squares due to error stating the assumptions for Three way classified data?
27. Latin Square Design is more efficient than Randomized Block Design (Considering Columns as Blocks). Justify
28. Derive expressions for estimating two missing observation in case of L.S.D and give the ANOVA Table.
29. What is a treatment contrast? When two such contrasts are said to be orthogonal? Show that in 2^2 factorial experiment main effects A, B and interaction effects AB are mutually orthogonal.
30. Explain the statistical analysis under 2^3 factorial experiment with ANOVA table.

(2016 Batch Onwards)

G 506.5b

Reg. No.:

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St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
February - 2022
STATISTICS - Paper VI
TOTAL QUALITY MANAGEMENT

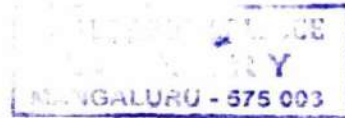
Time: 3 Hours.

Max Marks: 100

Note: Answer all parts

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

1. Define Statistical Quality Control.
2. Define Defective with an example.
3. How is process control achieved in Statistical Quality Control?
4. Write the control limits of np chart, when the standard is known.
5. When do you say that a process is under control?
6. Define quality as an attribute.
7. Mention any two uses of Statistical Quality Control.
8. What is acceptance sampling?
9. Briefly explain single sampling plan by attributes.
10. Write any two merits of control chart for attributes.
11. Define Average Sample Number.
12. Define indifference quality level of a lot.
13. What do you mean by ideal OC curve?
14. What is consumer's risk?
15. Briefly explain SSP by variable.

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

16. Explain the need for total quality management.
17. What are the objectives of Statistical Quality Control?
18. Explain the need for rational subgroups. What are the criteria behind the selection of rational subgroups?
19. Write a note on modified control limits.
20. Explain the concept of causes of variation in SQC.
21. Explain i) AQL ii) LTPD iii) PR iv) CR
22. Explain double sampling plan.
23. Derive the expression for ATI in case of SSP by attributes.
24. How do you construct an SSP by attributes based on LTPD and β for which ATI is minimum?

Contd...2

G 506.5b

PART – C

(10x4=40)

III. Answer any FOUR of the following.

25. Explain the essentials of total quality management.
26. Stating the assumptions and approximations clearly, derive the control limits of \bar{X} and R chart when its standard is known and unknown.
27. Define process capability. Explain its various relationship with the specification limits.
28. What are the criteria of lack of control with respect to control chart of variables?
29. Stating the assumptions construct SSP for variables when upper specification limit is given and σ is unknown.
30. Stating the assumptions clearly, derive the control limits of U chart when the standard is known and unknown.

(2014 Batch Onwards)

G 507.5a

Reg. No.:

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21

St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V- Degree Examination
February - 2022
BOTANY – PAPER V
ENVIRONMENTAL SCIENCE

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) Define a food chain. Give an example from an aquatic ecosystem.
- 2) What are mangroves?
- 3) What are Detritivores? Mention their significance.
- 4) Write any two functions of an ecosystem.
- 5) Comment on the ecological adaptation seen in *Dischidia*.
- 6) What is a phylloclade? Give an example.
- 7) What are pioneers in plant succession? Give an example.
- 8) Name any two plant parasites.
- 9) Define sustainable development.
- 10) Write any two urban problems related to energy.
- 11) What are the two benefits of resettlement?
- 12) Write any two strategies to help the people to curb the consumption habits.



SECTION – B

II Answer any SIX of the following.

(6x5=30)

- 1) Explain the energy flow in the ecosystem.
- 2) Define endangered and endemic species. Give two examples each from Indian species.
- 3) Describe the Ex-Situ conservation of plants with suitable examples.
- 4) Explain the morphological and physiological adaptations of halophytes.
- 5) Describe the morphological and anatomical adaptations of *Vanda*.
- 6) Explain the submerged stage and floating stages of Hydrosere.
- 7) Give an account of nuclear accidents and their consequences.
- 8) Explain the effect of consumerism on the environment.
- 9) Give an account of variation in global patterns of energy consumption.

SECTION – C

III Answer any FIVE of the following.

(5x10=50)

- 1) Explain the different types of ecological pyramids.
- 2) Give an account of different methods of biodiversity conservation.
- 3) Describe any one lotic aquatic ecosystem.
- 4) Explain the process and stages in Plant succession.
- 5) Give an account of morphological and anatomical adaptations of hydrophytes.
- 6) Explain the morphological adaptations seen in any five xerophytes.
- 7) Give an account of energy plantations in India.
- 8) Explain the different methods of rain water harvesting.
- 9) Write notes on
 - a) Causes and consequences of global warming
 - b) Environmental ethics.

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

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) What are Okazaki fragments? Where do you find them?
- 2) What are promoters? Mention their function.
- 3) Define Cistron and Recon.
- 4) Define Chargaff's Rule of Base Equivalence.
- 5) What is Epistasis? Mention any two types of it.
- 6) State the Law of Segregation of Factors.
- 7) Differentiate between Phenotype and Genotype.
- 8) What is Linkage? Mention its significance.
- 9) What is Nullisomy? Mention its significance.
- 10) How many types of trisomics are expected in *Datura*?
- 11) What is Triticale? Mention its significance.
- 12) What is Tandem duplication?

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

- 1) Explain the following stages of translation in Prokaryotes
 - i) Elongation
 - ii) Termination
- 2) Explain the following
 - i) Helicase and Ligase
 - ii) RNA Polymerase
- 3) Describe DNA as the transforming principle.
- 4) What is crossing over? Explain its types? Add a note on its significance.
- 5) Explain back cross and test cross with suitable examples.
- 6) What are Phenotypic F2 ratios obtained in i) Masking gene action
ii) Incomplete dominance iii) Supplementary factors iv) Dihybrid cross
v) Complementary factors vi) Monohybrid cross.
- 7) What is Frame Shift Mutation? Explain the events that lead to frame shift mutation.
- 8) Define i) Tautomerization ii) Germinal Mutations iii) Autotriploidy
iv) Translocations v) Monosomy
- 9) Write a note on sex chromosome of *Melandrium*.

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

- 1) Define transcription. Explain the process of transcription in Prokaryotes with a neat labeled diagram.
- 2) What is genetic code? Explain the salient features of genetic code.
- 3) With a neat labeled diagram explain DNA double helix model.
- 4) State the Law of Independent Assortment. Illustrate with a suitable example.
- 5) Explain Incomplete linkage with a plant example.
- 6) Describe Polygenic inheritance with plant example.
- 7) What are Inversions? Mention its types. Add a note on its Cytology.
- 8) Write a short on i) Spontaneous mutations ii) Lethal Mutations
- 9) What is Allopolyploidy? Describe the significance of allopolyploidy in plant breeding with two suitable examples.

(2014 Batch Onwards)

G 508.5a

Reg. No.:

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St Aloysius College (Autonomous)**Mangaluru****B.Sc. Semester V – Degree Examination****February - 2022****ZOOLOGY - Paper V****HISTOLOGY, REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY****Max Marks: 100****Time: 3 Hours.**

Note: i) Answer any **TEN** questions from **PART A** and **ONE FULL** question from each unit of **PART B**.
ii) Draw diagrams wherever necessary.

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

- Define microtome and give its significance.
- Mention the functions of any two papillae found on the tongue.
- Name the cells of islets of Langerhans
- Write the differences between primary oocyte and secondary oocyte.
- What is hermaphrodite? Give an example.
- What is acrosome? Mention its function.
- Write the scope of embryology.
- Define cleavage. write different types of cleavage.
- Give any two functions of amnion.
- Write a short note on identical twins.
- Give any four significance of placenta.
- Define grey crescent? Mention its significance.

**PART - B****Select ONE full question from each unit.****Unit I**

- With a neat labeled diagram explain the structure of T.S of mammalian ovary. **(10)**
- Describe the principle of hematoxylin – eosin staining. **(5)**
- Explain the T.S. of mammalian pancreas. **(5)**

OR

- With a neat labeled diagram explain the structure of T.S of mammalian stomach. **(10)**
- Write a note on wax embedding and blocking. **(5)**
- Explain T.S. of mammalian adrenal gland. **(5)**

Contd...2

Unit II

- IV a)** Explain the various phases with the diagrammatic representation of spermatogenesis up to formation of sperm. (10)
- b) Explain cyclic parthenogenesis by giving suitable example. (5)
- c) Define amphimixis. Explain the events leading to amphimixis. (5)

OR

- V a)** What are secondary sexual characters? with reference to human add note on sex hormones. (10)
- b) Explain briefly menstrual cycle. (5)
- c) Explain the cortical reaction with suitable illustrations. (5)

Unit III

- VI a)** With the help of labeled diagram explain the process of gastrulation in frog. (10)
- b) Draw a neat labeled diagram of hen's egg. (5)
- c) Explain the formation and development of yolk sac in chick. (5)

OR

- VII a)** Explain Notogenesis and Neurulation in frog giving suitable illustrations. (10)
- b) Draw and explain 24hours of chick embryo. (5)
- c) Explain the formation and development of chorion in chick. (5)

Unit IV

- VIII a)** What is placenta? With the neat labeled diagram explain the histological classification of placenta. (10)
- b) Write a note on gene bank and sperm bank (5)
- c) Explain the transplantation experiment of Spemann and mangold on amphibian gastrula. (5)

OR

- IX a)** Explain the process of ovulation, fertilization and implantation in humans. (10)
- b) Explain the structure of yolk sac placenta. (5)
- c) Write a note on artificial insemination. (5)

24

(2014 Batch Onwards)

G 508.5b

Reg. No.:

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St Aloysius College (Autonomous)

Mangaluru

B.Sc. Semester V – Degree Examination

February - 2022

ZOOLOGY – Paper VI

Environmental Biology, Biostatistics and wildlife Biology

Max Marks: 100

Time: 3 Hours.

Note: i) Answer any TEN questions from PART A and ONE FULL question from each unit of PART B.

ii) Draw diagrams wherever necessary.

PART - A

(10X2=20)

I Answer any TEN of the following.

- Explain mutualism with an example.
- Explain man engineered ecosystem with an example.
- What is eltonian pyramids?
- Discuss the fauna of estuarine zone.
- Write a note on ecological determinants?
- Explain any two methods to measure the population density.
- What is zone of tolerance?
- Define eutrophication?
- What is data? Name the two types.
- What is Wallaces line?
- Name any 4 fauna of Western Ghats.
- What is red data book?



PART - B

Select ONE full question from each unit.

Unit I

- What are food chains? Explain the various types of food chains with the help of schematic representation. **(10)**
- Write an explanatory note on biosphere. **(5)**
- What is thermal stratification. Explain the process in ponds **(5)**

OR

- Explain light as an abiotic factor and add a note on its effects on organisms. **(10)**
- Write an explanatory note on food web. **(5)**
- Write a brief note on Ecotone. **(5)**

Contd...2

G 508.5b

Unit II

- IV a)** Explain the zonation of sea with an illustration. (10)
- b) Explain ecological succession with an example. (5)
- c) Write a note on Gause's principle. (5)

OR

- V a)** What are ecological niche? Explain different types of ecological niches with examples. (10)
- b) Explain population growth curves. (5)
- c) Explain any 2 biomes of terrestrial habitat (5)

Unit III

- VI a)** Explain air pollution with reference to sources of pollution and their effect on animals. (10)
- b) Write a note on chi-square test. (5)
- c) Write a note on Biomagnification. (5)

OR

- VII a)** Write a note i) Standard deviation ii) Standard error (10)
- b) Write an explanatory note on radioactive pollution. (5)
- c) Write a note on methods of data collection. (5)

Unit IV

- VIII a)** Explain the differences between wildlife sanctuary and national park. (10)
- b) Give an account of wildlife in Himalayan region. (5)
- c) Write explanatory note on Australian realm. (5)

OR

- IX a)** Give an account of distribution of wildlife in Andaman and Nicobar islands. (10)
- b) Give an account on oriental realm. (5)
- c) Write a note on wildlife act 1972 (5)

G 509.5a

(2019 Batch Onwards)

Reg. No.:

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St Aloysius College (Autonomous)
Mangaluru

B.Sc. Semester V – Degree Examination
February - 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 TEN of the following:** (2x10=20)
- Toxic Shock Syndrome
 - Hyaluronidase
 - Pathogenicity
 - Local Immunity
 - Iatrogenic Infection
 - Super Antigens
 - Epitope
 - Null Cells
 - Adjuvant
 - Shigellosis
 - Immunosuppressive Agents
 - Toxoid

**PART – B**

Answer 'a' or 'b' and 'c' is compulsory from each unit. (15x4=60)

UNIT - I

2. a) Explain the mechanism of Innate immunity. (9)
- OR**
- b) Describe the modes of transmission of infections. (6)
- c) Write a note on Passive immunity. (6)

UNIT - II

3. a) Describe the structure of an Immunoglobulin molecule. (9)
- OR**
- b) Describe the biological classes of antigens. (6)
- c) Write a note on IgE. (6)

UNIT - III

4. a) Explain the structure and function of Thymus. (9)
- OR**
- b) Explain the process of cell mediated immune response. (6)
- c) Write a note on factors influencing antibody production. (6)

UNIT - IV

5. a) Describe the pathogenesis of Tetanus. (9)
- OR**
- b) Describe the laboratory diagnosis of infections caused by *Escherichia coli*. (6)
- c) Write a note on Kirby Bauer method. (6)

PART – C

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

- Classification of antibiotics.
- Exo and Endotoxins.
- Applications of monoclonal antibody.
- Lymphocytes.
- Mechanism of cell membrane inhibition by antibiotics.
- MALT

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**St Aloysius College (Autonomous)
Mangaluru**

B.Sc. Semester V – Degree Examination

February - 2022

MICROBIOLOGY – PAPER VI

PLANT MICROBIOLOGY AND BIOREMEDIATION

Time: 3 Hours.

Max Marks: 100

Instructions: Answer PART A AND B AND C

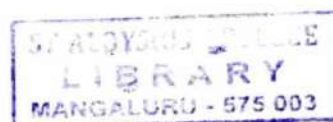
Draw Diagrams wherever necessary.

PART – A

1. **Define/Answer any TEN of the following:**

(2x10=20)

- a) Azolla
- b) Amylase
- c) Nodule
- d) Bacteria mediated frost injury
- e) Biofertilizer
- f) Cercosporin
- g) T toxin
- h) Dioxine
- i) Bioventing
- j) Humic Acid
- k) Biocontrol of soil borne diseases
- l) Persistence



PART – B

Answer 'a' or 'b' and 'c' is compulsory from each unit.

(15x4=60)

UNIT -I

2. a) Explain in detail about Azospirillum biofertilizer.

(9)

OR

b) Explain in detail about Blue green algal biofertilizer.

c) Write briefly on biological control of aerial plant parts with bacteria.

(6)

UNIT -II

3. a) Explain in detail about Koleroga in arecanut.

(9)

OR

b) Write a note on stages in development of diseases in plants.

c) Explain about Sandal Spike Disease.

(6)

UNIT -III

4. a) Explain about the biodegradation of Organic pollutants.

(9)

OR

b) Explain the environmental factors affecting biodegradation.

c) Write briefly on bioremediation.

(6)

UNIT -IV

5. a) Explain in detail the microbiology of pectin degradation.

(9)

OR

b) Explain in detail the microbiology of lignin degradation.

c) Write briefly about the effects of humus on plant growth.

(6)

PART – C

Answer any FOUR of the following.

(5x4=20)

6. a) Vermicomposting
- b) Fungal antagonists
- c) Symbiotic Nitrogen Fixation by Rhizobia
- d) Enzymes in plant diseases
- e) Phytoremediation
- f) Soil Sickness

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St Aloysius College (Autonomous)
Mangaluru

B.Sc. Semester V - Degree Examination

February - 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)

- What is Chargaff's rule?
- Write the structure of Thiamine and Adenine.
- What are Okazaki fragments?
- Why DNA is more stable than RNA?
- Write the difference between Nucleoside and Nucleotide.
- How does the flow of genetic information take place? What is it called?
- What is DNA topoisomerase?
- Mention stop codons and its name.
 - What are codons and anti-codons?
 - What are mutagens? Mention its types with example.
- Mention the effect of UV rays on DNA.
- What is conjugation?



PART – B

Answer any SIX of the following.

(5×6=30)

- Explain mRNA splicing mechanism.
- What is cot curve? Explain.
- Explain the Eukaryotic structure and functions of chromosomes.
- Explain the process of transcription in prokaryotes.
- Describe the Hershey Chase experiment.
- Explain the general features of genetic code.
- Explain how antibiotics act as translational inhibitor?
- Write about isolation of RNA.

PART - C

Answer any FIVE of the following:

(10×5=50)

- Explain steps involved in DNA replication.
- Write structure and functions of different forms of RNA.
- Explain how translational process takes place in prokaryotes.
- Explain post translational modification in eukaryotes.
- Explain Lac operon model.
- Explain Holiday model of recombination
- Explain gene transfer in bacteria with diagram.

St Aloysius College (Autonomous)**Mangaluru****B.Sc. Semester V - Degree Examination****February - 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)
- What are restriction enzymes?
 - What are Cybrids?
 - Write the principle of Western blotting.
 - What are secondary metabolites?
 - What are explants?
 - Mention the factors affecting the viability of protoplast culture.
 - What is the purpose of intellectual property rights?
 - Define the term fermentation? Mention any two applications.
 - Write any two applications of plant tissue culture.
 - Define the term Transfection and Transformation.
 - Write any two application of gene therapy.
 - What are Germplasms?

**PART – B**

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

- Describe the steps involved in DNA cloning.
- Write the principle and applications of the Chemostat in fermentation.
- Briefly describe the history of plant tissue culture.
- Discuss the role of *Agrobacterium* in gene transfer.
- Describe CRISPR-Cas9 based gene editing technique.
- Enlist the characteristics of plasmids: pBR322 & pUC19.
- Describe the method for production of vitamins (Riboflavin).
- Discuss on ethical issues and necessity of bioethics.

PART - C

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

- Discuss the various applications of genetic engineering.
- Describe the method and applications of Germplasm conservation.
- Write the requirements and steps involved in production of alcoholic beverages.
- Discuss the principle of polymerase chain reaction and its applications.
- Describe the method for production of antibiotics (penicillin and tetracycline).
- Describe the general steps involved in micro propagation technique.
- Write the steps involved in Protoplast Culture.

(2014 -2019 batch)

G 511.5a

Reg. No:

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St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
February -2022
BIOTECHNOLOGY – PAPER V
PLANT BIOTECHNOLOGY

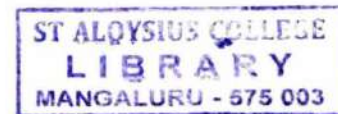
Time: 3 Hours

Max. Marks: 100

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

PART - A**(10×2=20)**

1. Answer any **TEN** of the following:
 - a) Define micropropagation
 - b) What are anti-browning agents? Give an example.
 - c) Define cellular totipotency
 - d) Write a note on surface sterilants used for explants in plant tissue culture
 - e) Define cybrid and add its applications
 - f) Which are the viability tests used to study isolated protoplasts?
 - g) What is continuous culture?
 - h) Define secondary metabolites with examples.
 - i) Define cryoprotectants with suitable examples
 - j) What is mean by germplasm conservation?
 - k) Define somaclonal variation with examples.
 - l) What are edible vaccines? Give examples.

**PART – B****(6×5=30)**

- Answer any SIX of the following:**
2. Describe on synthetic seed production
 3. Explain the role of auxins and cytokinins in plant tissue culture
 4. What is Callus culture? Explain the structure and morphology of callus.
 5. Discuss on Bergman's plating technique
 6. Explain how androgenesis contributes to the production of haploid plants.
 7. Write an account on selection of hybrid cells
 8. Explain BT cotton
 9. How callus culture eliminated viruses? Mention factors affecting on it.
 10. Explain the mechanism involved in generation of variants and its applications

PART – C**(5×10=50)**

- Answer any FIVE of the following:**
11. Explain in detail on plant tissue culture media
 12. Explain the general laboratory requirements for tissue culture
 13. Explain in detail on isolation of protoplasts
 14. Describe somatic hybridisation with its applications
 15. Explain the selection, identification, and recovery of transformed cells
 16. Discuss on *Agrobacterium* mediated gene transfer.

(2014 -2019 Batch)

G 511.5b

Reg. No:

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**St Aloysius College (Autonomous)
Mangaluru
B.Sc. Semester V – Degree Examination
February -2022
BIOTECHNOLOGY – PAPER VI
ANIMAL BIOTECHNOLOGY**

Max. Marks: 100

Time: 3 Hours

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

PART - A

(10×2=20)

1. Answer any **TEN** of the following.

- Expand PDT. Give one application
- Define cell lines. Give two examples.
- Give two examples for immunostaining techniques.
- Name any two dyes used in cell viability estimation.
- Give any two examples for hormones produced in genetic engineering.
- Mention any two applications of monoclonal antibodies.
- Differentiate between beneficial and useful equipment with one example each.
- Define cell synchronization. Give one application.
- Give two applications of organ culture.
- Write any two limitations of stem cell culture.
- Define xenotransplantation. Mention one application.
- Define germline gene therapy. Write one disadvantage.

**PART-B**

(6×5=30)

Answer any **SIX** of the following

- Give an account on characterization of cell lines.
- Comment on growth curve of cultured cells.
- Give an account of advantages of serum.
- Define somatic cell fusion. Explain the methods involved.
- Explain the method of suspension cloning.
- Elaborate on fish antifreeze protein production.
- Give an account of production of tissue plasminogen activator.
- Comment of various substrates used in monolayer cell culture.
- Write a note on stem cells.

PART - C

(5×10=50)

Answer any **FIVE** of the following.

- Explain reproductive cloning with an example. Add a note on its limitations.
- Give a detailed account of cell separation techniques.
- Elaborate on artificial media employed in cell culture.
- Explain the use of mammary glands of farm animals as bioreactors with suitable examples.
- Give an account of reporter genes and antibiotic resistance markers employed in cell culture.
- Explain the production of monoclonal antibodies.

St Aloysius College (Autonomous)
Mangaluru
B.A./B.Sc. Semester V – Degree Examination
February - 2022
COMPUTER ANIMATION – PAPER V
3D TEXTURING, CAMERA & LIGHTING

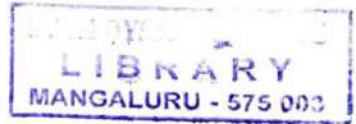
Time: 3 hrs.

Max Marks: 100

SECTION - A

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

1. a) What is the use of path constrain?
- b) How to create glass effect?
- c) Which files we can import to Projector map?
- d) What is the default color and intensity of Spot light?
- e) How to create a small bulbs in 3D scene?
- f) How to create the transparent object?
- g) What is the use of bump map?
- h) How to give Reflection to the tiles?
- i) Where do you find glow and ray?
- j) How to increase the frames in timeline?
- k) How to use hair & fur modifier?
- l) Which modifier to use for face texturing?



SECTION - B

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

2. Write down the steps of creating golden trophy.
3. Explain Free Spotlight & Target Spotlight.
4. What are the steps to use Multi sub object?
5. Explain about opacity map.
6. Write a note on Omni light.

SECTION - C

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

7. Write a note on UVW Map modifier.
8. Write a note on Sunlight and Daylight Systems.
9. Explain about camera animation.

SECTION - D

Answer any TWO of the following: **(20×2=40)**

10. Write down the steps to create the Rubik cube, net & Product bottle.
11. Write a note on material shaders and diffuse mapping.
12. Explain all the options of hair and fur modifier.

(2019 Batch Onwards)

32

G 110.5b/G 512.5b

Reg. No. :

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St Aloysius College (Autonomous)
Mangaluru
B.A./B.Sc. Semester V – Degree Examination
February – 2022
COMPUTER ANIMATION – PAPER VI
WEB TECHNOLOGY

Time: 3 hrs.

Max Marks: 100

SECTION - A

Answer any TEN of the following:

(2×10=20)

1. a) How to create a basic webpage? Explain.
- b) Explain LAN and WAN.
- c) Define the use of Tags.
- d) What are text-oriented sites? Describe.
- e) Name the attributes of tag.
- f) What are inline stylesheets?
- g) What is the use title tag?
- h) Describe the difference between <head> tag and <body> tag.
- i) Name the attributes of marquee Tag.
- j) Explain shared web hosting.
- k) What are anchor tags?
- l) Explain Campus Area Network.



SECTION - B

Answer any FOUR of the following:

(5×4=20)

2. Describe the Meta tags and give example.
3. How to make a login form using HTML? Explain.
4. Explain the unique features of World Wide Web.
5. Mention the types of Web Hosting Services.
6. Briefly explain the framesets with attributes.

SECTION - C

Answer any TWO of the following:

(10×2=20)

7. Name and explain the table tags with example.
8. Write a note on web Content Management System.
9. How to create a business website site? Explain.

SECTION - D

Answer any TWO of the following:

(20×2=40)

10. Describe the types of Cascading style sheets.
11. Explain all the text formatting tags with example.
12. Explain the steps to create animated Gradient color boxes.

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St Aloysius College (Autonomous)
Mangaluru
B.Sc. - Semester V – Degree Examination
February - 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. Find out HDI from the following table

Indicator	Value
Life expectancy at birth (years)	70.2
Expected years of schooling (years)	11.9
Mean years of schooling (years)	10.5
Gross national income per capita (2011 PPP \$)	8355

2. What is "take-off"?
3. What are the external sources of capital formation?
4. Write a note on man power planning.
5. Write a note on technology and economic development.
6. Write a note on sustainable agriculture.

PART - B

Answer any **FOUR** of the following questions in about 20 sentences each.

(4×10=40)

7. Find out Gender Inequality Index from the following table:

	Health		Empowerment		Labour market
	Maternal Mortality ratio	Adolescent Birth Rate	Parliamentary Representation	Attainment at Secondary and Higher Education	Labour Market Participation Rate
Female	18	17	11.1	90.5	43.4
Male	NA	NA	18.1	95.9	59.5

8. Explain Myrdal's theory of circular causation.
9. Explain the role of state in economic development.
10. Find out simple pay back period and discounted pay back period from the following table.
Cash outflows is Rs 20,000 and MDR = 10%.

Years	Cash in flows(in '000)
1	15000
2	25000
3	30000
4	35000
5	15000
6	25000



11. Explain how population retards economic development.
12. Explain the pattern of industrialisation of Indian Economy.

PART - C

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

13. Explain the determinants of Economic development.
14. Explain the unbalanced growth theory of economic development.
15. Examine Lewis' theory of unlimited supply of labour.
16. What is capital budgeting? Explain the methods of capital budgeting.

G 513.5b

(2019 Batch Onwards)

Reg. No. :

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34

St Aloysius College (Autonomous)

Mangaluru

B.Sc. - SEMESTER V – Degree Examination

February - 2022

ECONOMICS – Paper - VI
MATHEMATICAL ECONOMICS

Time: 3 hrs.

Max Marks: 100

Note: Graph sheets and Log table will be provided.

PART - A

Answer any **FOUR** of the following questions.

(4×5=20)

- The supply for a certain commodity is $X = -2 + 50Y$ (assume X represents quantity supplied and Y represents price)
 - Find the quantity supply if the price is Rs.50?
 - Find the price if the quantity supplied is 15 units?
 - What is the lowest price at which this commodity could be supplied?
 - Graph the supply curve.
- If $C = 100 + 0.8Y$, $I = 50 + 0.1Y$ and $G = 200$. Find out the equilibrium values of national income, consumption expenditure, investment expenditure and savings function of the economy.
- If the demand function of a certain commodity is formed to be:
 $D = 40 - 2P$. Calculate the price elasticity of demand when $P = 10$, $P = 15$ and $P = 5$
- Suppose the fixed cost of production for a commodity is Rs.5000; the variable cost is Rs.7.50 per unit and the commodity sells for Rs.10 per unit. What is the break-even quantity?
- A company has the following Total revenue function.
 $R = 24x - 3x^2$
 - What equation represents the average revenue function?
 - What equation represents the marginal revenue function?
 - At what level of output the revenue of the company maximum?
- Marginal Cost as a function of units produced is given by $MC = 2 + 60x - 5x^2$. Find the total and average cost functions if fixed cost is 45.

PART - B

Answer any **FOUR** of the following questions.

(4×10=40)

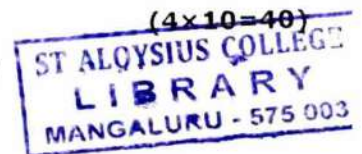
- The demand and supply curves of a commodity are given as
 $D = 100 - 2p$
 $S = -20 + p$

Find the market equilibrium price and quantity algebraically and graphically.

- Pareto's Law of Income distribution for a particular group is given by

$$N = \frac{8x10^8}{x^{3/2}}$$

- How many people have income exceeding Rs.1600
 - How many people have income between Rs 1600 and Rs.3600?
- The Average Revenue function for a particular commodity is $Y = 12 - 5x$ and the Average Cost to the monopolist is $\bar{Y}_c = 4x + 6$.
Determine the Maximum possible profit obtainable by a monopolist.



G 513.5b

10. If the average cost function is $\bar{Y}_c = 3x + 5 + \frac{6}{x}$
- What equation represents the total cost function?
 - What equation represents the marginal cost function?
 - At what quantity will average cost be minimum?
 - 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

$$MR = 25 - 3x$$

$$MC = 25 - 7x + x^2$$

12. Solve the following simultaneous equations using Cramer's rule.

$$3x + 10y = 16$$

$$8x + 3y = 19$$

PART - C

(2×20=40)

Answer any TWO of the following questions.

13. The demand and supply function of a certain commodity are $S = -4+3P$ and $D = 20-2P$.
- Find out the equilibrium values of price and quantity.
 - What happens to equilibrium values when a subsidy of Rs.1 is given?
 - What is the loss of revenue to the government?
 - Determine how the subsidy is shared between the producer and consumer
14. The New Tool Manufacturing Company has a TC function represented by

$$TC = X^3 - 6X^2 + 14X + 6$$

- What equation represents the MC and find the MC
 - What equation represents the AC and find the AC.
 - Determine the level of output at which average cost is the minimum.
15. a) Explain the usefulness of integral calculus in Economic analysis.
- b) If the Demand function is $Y = 16 - x^2$ and the Supply function is $Y = 2x + 1$, where y refers to price and x represents quantity. Find consumer's surplus and producer's surplus under pure competition.
16. a) Explain the meaning and usefulness of Linear Programming.
- b) Obtain the optimum solution for the following linear programming problem.

$$\text{Maximize } Z = 6x_1 + 3x_2$$

$$\text{Subject to } 4x_1 + x_2 \leq 12$$

$$2x_1 + 2x_2 \leq 10$$

$$2x_1 + 4x_2 \geq 8$$

$$x_1, x_2 \geq 0$$
