

(2021 Batch Onwards)

G 501 DC1.5

Reg. No. :

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**PHYSICS Paper – V (a)**

**CLASSICAL MECHANICS AND QUANTUM MECHANICS**

Time: 2½ hrs.

Max Marks: 60

**SECTION – A**

Answer any **FOUR** of the following.

(4x2=8)

1. a) In the absence of external torques, how does the angular momentum of a rotating object change, according to the conservation of angular momentum?
- b) What is the basic assumption of classical mechanics regarding the motion of objects?
- c) What is work done in classical mechanics, and how is it calculated?
- d) State the fundamental difference between the Lagrangian and Hamiltonian formulations of classical mechanics.
- e) What is the connection between the Hamiltonian formalism and quantum mechanics?
- f) Explain briefly the dual nature of matter.

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**SECTION – B**

Answer any **ONE FULL QUESTION** from each unit.

(4x10=40)

**UNIT-I**

- 2.a) Explain how the presence of external torques affects the conservation of angular momentum. Using diagrams and mathematical relations, derive the equation that relates external torque to the rate of change of angular momentum in a rotating system. (6)
- b) Explain the concept of a conservative force in classical mechanics and outline the steps involved in deriving a potential energy function associated with a conservative force. (4)
- 3.a) Derive the equation of motion for the two-body problem under Newtonian gravity. Show how the problem can be reduced to the motion of a single particle with reduced mass in a central potential. (6)
- b) Derive D'Alembert's principle for a particle in a rotating reference frame. Explain how the principle simplifies the analysis of non-inertial frames. (4)

**UNIT-II**

- 4.a) Explain how D'Alembert's principle leads to the concept of virtual work and use it to derive the expression for the Lagrangian  $L=T-V$  for a particle moving in a conservative force field. (6)
- b) Derive the expression for mechanical energy in a conservative system and explain the significance of this energy in the context of motion. (4)

Contd...2

- 5.a) Derive Lagrange's Equation using Hamilton's Principle and arrive at the equation for action principle using Euler Theorem (6)
- b) Explain the relationship between Hamilton's Principle and the principle of least action. How are they equivalent in determining the motion of a system? (4)

### UNIT-III

- 6.a) Give a schematic sketch of an experimental arrangement for observing the Compton effect. Derive the expression for the Compton shift. (6)
- b) Derive the de-Broglie wavelength for an electron in terms of temperature. (4)
- 7.a) Explain how the single-slit diffraction experiment using an electron beam demonstrates the uncertainty principle. (6)
- b) Obtain the time-energy uncertainty relation from the position-momentum uncertainty. (4)

### UNIT-IV

- 8.a) Derive the three-dimensional time-dependent Schrödinger equation and write it in terms of the Hamiltonian operator. (6)
- b) Arrive at the Eigen value for infinite one dimension well (4)
- 9.a) State and explain in detail any three postulates of quantum mechanics. (6)
- b) Explain probability interpretation of Quantum mechanics wave function (4)

### SECTION - C

Answer any **THREE** from the following.

(3x4=12)

10. A bicycle wheel has a radius of 0.5 meters and is spinning at 10 revolutions per second. Calculate its angular velocity in radians per second and the angular momentum if its moment of inertia is  $0.1 \text{ kg}\cdot\text{m}^2$ .
11. A 50 kg box is pushed across a horizontal surface with a force of 100 N. If the box moves a distance of 5 meters and experiences a frictional force of 30 N in the opposite direction, calculate the net work done on the box.
12. What should be the kinetic energy of a neutron in eV so that its associated de Broglie wavelength is  $1.4 \times 10^{-10} \text{ m}$ ? Mass of neutron =  $1.675 \times 10^{-27} \text{ kg}$ .
13. Can the matter wave associated with a free particle be represented by the wave function  $\psi(x, t) = A \cos(kx - \omega t)$  Justify your answer.

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(2021 Batch Onwards)

G 501 DC3.5

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**PHYSICS – Paper V(b)**

**Elements Of Atomic, Molecular and Laser Physics**

Time: 2½ hrs.

Max Marks: 60

**SECTION – A**

Answer any **FOUR** of the following.

(4x2=8)

1. a) What is the structure of atom according to Rutherford's atom model?
- b) Define ionization energy of an atom and write its value for hydrogen atom.
- c) Can  $^2P_{5/2}$  state exist? Give reason.
- d) State the selection rules for rotational spectrum and vibrational spectrum.
- e) What are stoke's and anti-stoke's lines in Raman spectrum?
- f) Mention any two applications of laser.

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**SECTION – B**

Answer any **ONE FULL QUESTION** from each unit.

(4x10=40)

**UNIT-I**

- 2.a) Describe Bohr's theory of hydrogen atom and derive expressions for  
i) radius of permitted orbits and ii) velocity of electrons. (6)
- b) With neat figure explain Franck-Hertz experiment to prove the quantum states of an atom. (4)
- 3.a) Starting with the expression for the wave number discuss the different spectral series of hydrogen atom. (6)
- b) Explain Ritz combination principle. (4)

**UNIT-II**

- 4.a) What are coupling schemes? Explain L-S and J-J coupling in multielectron system and represent them vectorially. (6)
- b) Derive the expression for magnetic dipole moment of electron due to orbital motion. (4)
- 5.a) Describe the various quantum numbers associated with the vector atom model (6)
- b) With neat figure explain the fine structure of sodium D lines. (4)

**UNIT-III**

- 6.a) Obtain an expression for the vibrational energy levels of a diatomic molecule and the frequency of vibrational spectra. (6)
- b) Explain the classification of molecules based on their moments of inertia. Provide examples for each classification. (4)

Contd...2

- 7.a) Based on the quantum theory explain Raman effect. (6)
- b) What is luminescence? Explain the difference between fluorescence and phosphorescence. (4)

**UNIT-IV**

- 8.a) What are Einstein's A and B coefficients? Derive the relation between Einstein's A and B coefficients (6)
- b) Explain the characteristics of laser light. (4)
- 9.a) With the help of neat energy level diagram, explain the construction and working of Helium- Neon laser. (6)
- b) What is meant by population inversion? Explain the different methods of pumping used to achieve population inversion. (4)

**SECTION -C**

Answer any **THREE** from the following.

(3x4=12)

10. The wavelength of first member of Balmer series is  $6563\text{\AA}$ . Calculate the wavelength of second member of Lyman series.
11. For  $l = 1$  and  $s = \pm \frac{1}{2}$ , find quantum numbers  $j$  and then  $m_j$  for each value of  $j$ . Also represent  $m_j$  values vectorially
12. The  $J = 0$  to  $J = 1$  absorption line in carbon monoxide occurs at a frequency  $1.153 \times 10^{11}$  Hz; calculate the moment of inertia, bond length.
13. A gas laser is generating a laser beam of 4mW power. Calculate the number of photons emitted by the laser. The wavelength of the emitted radiation is 680 nm.

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**CHEMISTRY - V (a)**

**Inorganic and Physical Chemistry - III**

Time: 2½ hrs.

Max Marks: 60

- 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 all the following questions.

(1×8=8)

- 1.a) What is the bond order of CO according to molecular orbital (MO) theory?
- b) Based on VSEPR theory give the hybridisation of IF<sub>7</sub>.
- c) What is a chelating ligand?
- d) Give any one limitation of crystal field theory.
- e) What are ideal solutions?
- f) What are concentration cells?
- g) Write the equation for the determination of binding energy per nucleon.
- h) What is an operator? Give an example.

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**PART- B**

Answer any EIGHT of the following questions.

(3×8=24)

- 2.(i) What is lanthanide contraction? How is it caused?
- (ii) What is Lande's factor? Explain how it is used to calculate the magnetic moment of transition elements.
- (iii) Explain the structure and geometry of [Ni(CO)<sub>4</sub>] using Valence Bond theory.
- (iv) Discuss briefly the acid base reactions in N<sub>2</sub>O<sub>4</sub>.
- (v) Calculate the osmotic pressure of 10% solution of glucose at 25 °C.
- (vi) Explain Beckmann's method of determination of molecular mass of a solute.
- (vii) Give the differences between thermal and nuclear reactions.
- (viii) What is an Eigen function? Determine whether Cos2x is an Eigen function for the operator d<sup>2</sup>/dx<sup>2</sup>.
- (ix) A solution of 2.5 g of a non-electrolyte in 40 g of water freezes at 275.75 K. Calculate the molecular weight of the solute (K<sub>f</sub> = 1.86 K kgmol<sup>-1</sup>).
- (x) The increase in ionisation energies of 3d metals is not as pronounced as in the s- and p-block elements in the same period. Give reason.

**Contd...2**

## PART - C

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

(4×7=28)

3. How does crystal field splitting occur in octahedral complexes?
4. Discuss the construction and working of calomel electrode.
5. Explain nuclear fission and nuclear fusion reactions with suitable examples.
6. Outline a comparison of azimuthal and magnetic quantum numbers. Give the values of  $l$  and  $m$  for (i)  $3s$  and (ii)  $4p$  electrons.
7. Differentiate between paramagnetic and diamagnetic substances. Predict the magnetic behaviour of  $\text{Cu}^+$  and  $\text{Mn}^{2+}$  ions.
8. Describe how the HSAB concept helps in predicting the following:  
(a) Feasibility of a reaction (b) Relative stabilities of the complexes.
9. Calculate the change in free energy for the cell,  $\text{Mg} | \text{Mg}^{2+} || \text{Ag}^+ | \text{Ag}$ ;  
 $E^\circ_{\text{Ag}} = 0.8 \text{ V}$  and  $E^\circ_{\text{Mg}} = - 2.37\text{V}$ . (Given  $F = 96,500 \text{ C/mol}$ ).
10. Explain the principle behind the potentiometric titration of HCl against NaOH.
11. Determine the term symbols for the microstates possible for the  $1s^2 2s^1 2p^1$  excited-state electronic configuration of beryllium.

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**St Aloysius College (Autonomous)**  
**Mangaluru**

**B.Sc. Semester V – Degree Examination**  
**October/November - 2025**

**CHEMISTRY – V (b)**  
**ORGANIC CHEMISTRY AND SPECTROSCOPY - I**

Time: 2½ hrs.

Max Marks: 60

- 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 all the following questions.

(1×8=8)

- 1.a) Give an example for a 1,2-azole.
- b) Give an example for condensed heterocyclic compound.
- c) Write the structure of zwitter ion.
- d) Give the reduction reaction of amino acid with  $\text{LiAlH}_4$ .
- e) How is wave number and wavelength related?
- f) Give the selection rule for rotational spectra.
- g) Define the term auxochrome.
- h) In impure ethanol what is the multiplicity of hydrogen atom of  $-\text{CH}_2$ ?

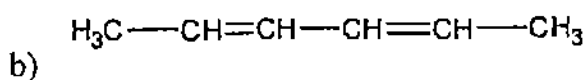
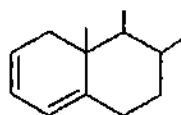
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**PART- B**

Answer any EIGHT of the following questions.

(3×8=24)

- 2.(i) Explain synthesis of furan from 1,4-diketone.
- (ii) Compare the basicity of pyridine and piperidine.
- (iii) Write any two electrophilic substitution reactions of indole.
- (iv) How do you convert fructose to glucose?
- (v) Explain the classification of carbohydrates based on hydrolysis.
- (vi) Explain the condition for a molecule to show Raman spectroscopy.
- (vii) What are fundamental bands and overtones in IR spectroscopy?
- (viii) Explain nuclear shielding in  $^1\text{H}$ NMR spectroscopy.
- (ix) Find out the absorption maximum for the following compounds:



- (x) Predict the multiplicity of each hydrogen atom present in the following compounds: a)  $\text{CH}_3\text{CH}_2\text{OH}$  b)  $\text{CH}_3\text{CHO}$ .

Contd...2

## PART - C

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

(4×7=28)

3. Describe the Skraup synthesis of Quinoline.
4. Give any two electrophilic substitution reactions of thiazole.
5. Give the mechanism of osazone formation.
6. Explain the mutarotation in D-glucose.
7. The force constant of HF molecule is  $970 \text{ Nm}^{-1}$ . Calculate the fundamental vibration frequency in Hz. Given atomic mass of H = 1.008 amu, atomic mass of F = 18.998 amu.
8. Derive an expression for wave number of spectral lines in rotational spectroscopy.
9. Explain any two factors which affect the chemical shift value.
10. Explain the different types of electronic transitions in UV spectroscopy.
11. Explain the effect of anharmonicity on IR spectra.

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**St Aloysius College (Autonomous)**  
**Mangaluru**  
**B.Sc. SEMESTER V - DEGREE EXAMINATION**  
**October / November - 2025**  
**Mathematics - V (a)**  
**Real Analysis II and Complex Analysis**

Time : 2 ½ Hours

Max. Marks : 60

**PART - A**Answer any **SIX** of the following .**(6x2=12)**

1. Define lower sum of a bounded, real valued function  $f$  on  $[a, b]$ .
2. Let  $f(x) = \frac{1}{x}, 1 \leq x \leq 2$  and  $P = \{1, 1.2, 1.4, 1.6, 2\}$  be a partition of  $[1, 2]$ . Compute  $U(P, f)$ .
3. Define gamma function.
4. Check the convergence of  $\int_1^{\infty} \frac{1}{1+x^2} dx$ .
5. Find the domain of  $f(z) = \frac{z}{z+|z|}$ .
6. Show that  $\lim_{z \rightarrow \infty} \frac{2z^2-1}{z^2+1} = \infty$ .
7. Evaluate  $\int_C \frac{1}{z} dz$ , where  $C$  is the semicircle  $z = Re^{i\theta}, -\pi \leq \theta \leq \pi$ .
8. Evaluate  $\int_0^{\pi/4} e^{it} dt$ .

**PART - B**  
**UNIT - I**Answer any **TWO** of the following .**(2x6=12)**

1. Show that the constant function  $k$  is integrable on any Interval  $[a, b]$ .
2. State and prove condition for integrability.
3. Define Riemann sum. Using Riemann sum, show that  $\int_1^2 f dx = \frac{11}{2}$  where  $f(x) = 3x + 1$ .

**UNIT - II**Answer any **TWO** of the following .**(2x6=12)**

1. i). Evaluate  $\int_0^1 x^4(1-x)^3 dx$  (2)
- ii). Prove that  $\Gamma(n) = \int_0^1 \left[\log \frac{1}{y}\right]^{n-1} dy$  (4)
2. i). Show that  $\int_0^1 x^{\frac{5}{2}}(1-x)^{-\frac{1}{2}} dx = \frac{63}{256}\pi$  (2)
- ii). Prove that  $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$ . (4)
3. Define Improper integrals of type I and type II and hence evaluate  $\int_{-\infty}^{\infty} \frac{1}{1+x^2} dx$ .

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**UNIT - III**Answer any **TWO** of the following .**(2x6=12)**

1. Show that the function  $u = e^{-y} \sin x$  is harmonic and find its harmonic conjugate.
2. Let the function  $f(z) = u(x, y) + iv(x, y)$  be defined throughout some neighborhood of a point  $z = x_0 + iy_0$ . Suppose that the first-order partial derivatives of the function  $u$  and  $v$  with respect to  $x$  and  $y$  exist everywhere in that neighborhood and that they are continuous at  $(x_0, y_0)$ . If the partial derivatives satisfy the C-R equations  $u_x = v_y$  and  $u_y = -v_x$  at  $(x_0, y_0)$ , then prove that  $f'(z_0)$  exists.
3. Show that  $|z_1 + z_2| \leq |z_1| + |z_2|$ , for any two complex numbers  $z_1$  and  $z_2$ .

**UNIT - IV**Answer any **TWO** of the following .**(2x6=12)**

1. State Cauchy-Goursat theorem and hence show that  $\int_C \frac{z^2}{z-3} dz = 0$  where the contour  $C$  is the unit circle in either directions.
2. i). Define simply connected and multiply connected domains.  
 ii). State Cauchy's Integral formula.  
 iii). Evaluate  $I = \int_C f(z) dz$  where  $f(z) = \frac{\cos z}{z(z^2+8)}$  and  $C$  is the square contour, whose sides lie along the lines  $x = \pm 2, y = \pm 2$ , using Cauchy's Integral formula.
3. Evaluate the integral  $I = \int_C f(z) dz$  where  $f(z) = \begin{cases} 1, & \text{when } y < 0 \\ \frac{1}{4y}, & \text{when } y > 0 \end{cases}$  and  $C$  is the arc from  $z = -1 - i$  to  $z = 1 + i$  along the curve  $y = x^3$ .

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**St Aloysius College (Autonomous)**  
**Mangaluru**  
**B.Sc. SEMESTER V - DEGREE EXAMINATION**  
**October /November - 2025**  
**Mathematics - V (b)**  
**Vector Calculus and Graph Theory**

Time : 2 ½ Hours

Max. Marks : 60

**PART - A**Answer any **SIX** of the following .

(6×2=12)

1. Prove that  $\text{div}(r \times a) = 0$  taking  $r = (x, y, z)$  and  $a = (a_1, a_2, a_3)$ .
2. Find the volume of parallelepiped of  $\vec{a} = 2\hat{i} + 5\hat{j} + 6\hat{k}$ ,  $\vec{b} = \hat{i} + 2\hat{j} - 4\hat{k}$ ,  $\vec{c} = 4\hat{i} - 2\hat{j} + 5\hat{k}$ .
3. Evaluate  $\int_C \vec{F} \cdot d\vec{r}$  where,  $\vec{F} = x^2 \hat{i} + y \hat{j} + z \hat{k}$  and  $\vec{r} = t\hat{i} + t^2\hat{j} + t^3\hat{k}$  varying from  $t = 0$  to  $3$ .
4. State Stoke's Theorem.
5. Define Length of the path. Give an example.
6. Prove that in a binary tree of  $n$  vertices, the number of pendant vertices is  $\frac{n+1}{2}$ .
7. Define edge connectivity. Give an example.
8. Define proper colouring of a graph.

**PART - B**

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**UNIT - I**Answer any **TWO** of the following .

(2×6=12)

1. Discuss the geometric interpretation of scalar triple product.
2. Find the curvature and torsion of the curve  $r(t) = -5t\hat{i} + 2t^3\hat{j} + 3t^4\hat{k}$  at  $t = 2$ .
3. i) Find the tangent plane and normal line to the surface  $\cos \pi x - x^2y + e^{xz} + y - 4 = 0$  at  $P_0 = (0, 1, 2)$ .  
 ii) Find the curl of  $\vec{F} = (x^2 - y^2 + 2xz)\hat{i} + (xz - xy + yz)\hat{j} + (z^2 + x^2)\hat{k}$ .

**UNIT - II**Answer any **TWO** of the following .

(2×6=12)

1. State Green's theorem and hence verify the theorem for  $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$  where  $C$  is the curve of the region bounded by  $y = 0, x = 0, x + y = 1$ .
2. Evaluate the line Integral  $\int_C \vec{F} \cdot d\vec{r}$  where,  $\vec{F} = (x^2 + y^2)\hat{i} - 2xy\hat{j}$  and curve is the rectangle in the plane bounded by  $y = 0, x = 2, x = 0, y = 3$ .
3. Verify the Stoke's Theorem for  $\vec{F} = (x^2 + y^2)\hat{i} - 2xy\hat{j}$  taken over the rectangle bounded by  $x = a, x = -a, y = 0, y = b$ .

**UNIT - III**Answer any **TWO** of the following .

(2×6=12)

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 graph  $G$  is a tree iff there is one and only one path between every pair of vertices.
3. Define distance between any two vertices in a graph  $G$  and prove that it is a metric.

**UNIT - IV**Answer any **TWO** of the following .

(2×6=12)

1. Prove that Kuratowski's second graph is non-planar.
2. With respect to a given spanning tree  $T$ , prove that a chord  $C_i$ , that determines a fundamental circuit  $\gamma$  is contained in every fundamental cutset associated with the branch of  $\gamma$  and in no others.
3. Prove that an  $n$ -vertex graph is a tree if and only if its chromatic polynomial is  $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$ .

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## St Aloysius College (Autonomous)

### Mangaluru

#### B.Sc. Semester V – Degree Examination

October/November - 2025

#### ELECTRONICS - V(a)

#### ELECTRONIC COMMUNICATION SYSTEMS

Time: 2½ hrs.

Max Marks: 60

#### SECTION – A

1. Choose the correct answer from the choices given at the end of each question and Write the correct answer (1x6=6)

- i) Which of the following is NOT an advantage of optical fiber communication?
  - a) High bandwidth
  - b) Immunity to electromagnetic interference
  - c) High attenuation
  - d) Light weight and small size
- ii) PWM signal generated by \_\_\_\_\_ circuit.
  - a) Comparator
  - b) Astable
  - c) bistable
  - d) free running
- iii) An LED is made up of \_\_\_\_\_
  - a) Phosphorescent material
  - b) GaAs
  - c) Silicon
  - d) Germanium
- iv) In a telephone communication system the highest voice frequency is 3 kHz. For this the minimum sampling rate is \_\_\_\_\_
  - a) i) 4 kHz
  - ii) 6 kHz
  - iii) 2 kHz
  - iv) 8 kHz
- v) If 70% of electrons recombine with holes radiatively in a LED, then the quantum efficiency is \_\_\_\_\_
  - a) 20%
  - b) 80%
  - c) 70%
  - d) 30%
- vi) IMEI Stands for \_\_\_\_\_.
  - a) internal mobile equipment identity
  - b) international mobile equipment identity
  - c) Indian mobile equipment identity
  - d) Intra mobile enable identity.

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2. Answer any **SIX** questions

(1x6=6)

- i) Give the full form of GSM.
- ii) What do you mean by SPLICER?
- iii) Name one Photo junction device used as Photodetector.
- iv) State Nyquist's sampling theorem.
- v) What is meant by Response time of an optical detector?
- vi) Given Numerical Aperture is 0.25 and the refractive index of air = 1, calculate the acceptance angle ( $\theta_a$ ).
- vii) What is the magnitude of duplex distance in GSM900?
- viii) What does "IP" stand for in internet terminology?

3. Answer any **SIX** questions

(2x6=12)

- i) In a certain time, interval  $6 \times 10^6$  photons incident on a photodetector. Calculate the quantum efficiency, if  $5.4 \times 10^6$  electron-hole pairs are generated.

Contd...2

- ii) Briefly explain FDMA, TDMA and CDMA
- iii) Calculate the Attenuation through the optical fiber when the mean optical power launched into a 5 km length of fiber is  $120\mu\text{W}$  and the mean optical power at receiver is  $4\mu\text{W}$ .
- iv) Mention the frequency ranges of uplink and downlink in GSM 900 mobile communication system.
- v) Draw the circuit diagram of Optocoupler.
- vi) Explain the principle of a photoconductive cell.
- vii) What is internet banking? Explain
- viii) With a block diagram explain the demodulation of PAM signals.

#### SECTION – B

#### 4. Answer any **FOUR** questions (4x4=16)

- i) With a circuit diagram explain detection of PCM.
- ii) With block diagram explain the outgoing call in GSM.
- iii) Mention any four different combinations of materials used in the construction of core and cladding of glass Optical fibres.
- iv) Find the Numerical aperture and acceptance angle of an optic fibre which is immersed in a liquid of refractive index 1.35. Given Refractive index of core is 1.55 and that of cladding is 1.45.
- v) Explain Internet domains with examples.
- vi) Explain the construction and action a solar cell.

#### SECTION – C

#### 5. Answer any **FOUR** full questions. (5x4=20)

- i) Obtain an expression for the Numerical aperture and Acceptance angle of an optical fibre. (5)
- ii) The refractive index of core of step index fibre is 1.50 and fractional change in index of refraction is 4%. Estimate (i) Refractive index of cladding (ii) NA (iii) Maximum value of angle of incidence to the fibre axis (iv) Critical angle at Core-cladding interface. (5)
- iii) With a circuit diagram explain the generation of PWM. (5)
- iv) With necessary diagrams Explain Direct and Indirect band gap Materials. (5)
- v) With block diagram explain GSM architecture. (5)
- vi) With necessary diagrams, explain i) cell splitting ii) Call Handoff in GSM (5)

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**ELECTRONICS –V (b)**

**EMBEDDED SYSTEMS**

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

**Time: 2 ½ hrs.**

**Max Marks: 60**

**SECTION – A**

**1. Choose the correct answer from the choices given at the end of each question and write the correct answer. (6x1=6)**

i) -----is the content of Accumulator after the execution of the instruction MOV A, #00H.

- a) FFH      b) 0FH      c) 00H      d) 16H

ii) 8051 MC has ----math flags.

- a) 6      b) 5      c) 4      d) 6

iii) \_\_\_\_\_ Register of 8051 MC does not have the internal address.

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

iv) The addressing mode of MOV R<sub>1</sub>, #FFH is \_\_\_\_\_.

- a) direct      b) indirect      c) immediate      d) register

v) 8051 MC has -----ports.

- a) 1      b) 8      c) 3      d) 4

vi) There are ----flags in 8051MC

- a) 2      b) 4      c) 5      d) 7

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**2. Answer any SIX questions. (6x1=6)**

- i) List any two instructions to clear the contents of Accumulator.
- ii) With syntax explain SWAP instruction of 8051MC.
- iii) Give one example for three byte instruction in 8051MC.
- iv) Mention any one difference between timers and counters.
- v) How many locations are present in the internal RAM of 8051 MC?
- vi) Write the instructions used to set and reset the carry flag in 8051 MC.
- vii) Draw the bit pattern of PSW of 8051MC.
- viii) Mention any two registers of PIC18.

**3. Answer any SIX Questions. (6x2=12)**

- i) Draw the bit pattern of TMOD and mention the function of each bit.
- ii) Write a 8051 MC program to add two bytes of data present in any two external memory locations and store the result in accumulator.
- iii) List the interrupts of 8051MC.
- iv) List the alternate functions of port3 pins of 8051MC.

v) What is the content of accumulator after the execution of the following set of instructions in 8051 MC?

```

CLRC
MOV R0, #08H
MOV A,#02H
SUBBA, R0
LCALL 0003H

```

vi) Write instructions to add the values 16H and 43H. Place the result in the WREG register.

vii) With example explain immediate addressing mode of 8051 MC.

viii) Write the functions of four modes of Timer/counter of 8051MC.

**SECTION – B**

**4. Answer any FOUR Questions.**

**(4x4=16)**

i) Draw the labeled pin diagram of 8051 MC.

ii) With a block diagram explain the working of timer0 in Mode1.

iii) With syntax and example explain i) CJNE and ii) DJNZ instructions of 8051 MC.

iv) With example explain any two rotate instructions of 8051MC.

v) With example explain any two logical instructions of 8051MC.

vi) With bit pattern explain the Status register of PIC18.

**SECTION – C**

**5. Answer any FOUR questions.**

**(5x4=20)**

i) With syntax and example, explain any three data transfer instructions of 8051MC.

ii) With necessary diagram describe the organization of internal RAM of 8051MC.

iii) What is stack? With example explain how data is stored and retrieved in stack of 8051 MC.

iv) Write an 8051MC program to divide two bytes of data stored at external memory locations X and X+1. Store the answers in locations X+2 and X+3.

v) Write an 8051MC program to Store the largest of two bytes of data stored at external memory locations X and X+1. Store the answers in locations X+2.

vi) With syntax and example explain MOVLW instruction of PIC18.

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**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**COMPUTER SCIENCE – V (a)**

**PROGRAMMING IN PYTHON**

Time: 2 ½ Hours.

Max Marks: 60

**PART –A**

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

(6x2=12)

- Name any two flavours of python.
- Calculate the value of the following expression:  $15/(3+2)+7*3-1$
- Explain append () and extend () in list.
- How to delete or remove elements from dictionary?
- How do you create an Identity matrix in NumPy?
- What is inheritance? Give example.
- Name any two application of data visualization?
- What is the difference between commit() and rollback() in database operation?

**PART –B**

Answer any **ONE FULL** question from each unit.

(4x12=48)

**UNIT - I**

- What are the types of operators in Python? Explain. (4)
  - Describe the process of importing libraries in python. Provide examples using math and random libraries. (4)
  - What is the use of try and except block in python? Provide one example. (4)

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- Explain thrust area of python. (4)
  - List and explain different data types available in python. (4)
  - What is default argument and keyword argument? Give example. (4)

**UNIT – II**

- Explain string concatenation and joining with example. (4)
  - What is dictionary in python? Write a short note on following dictionary methods (a) get(key) (b) clear () (4)
  - Explain any four set methods with example. (4)
- Explain three basic string operation with example. (4)
  - List and explain any four list methods with suitable example. (4)
  - Explain basic tuple operations with example. (4)

**UNIT – III**

- 6. a) What is class? How class and object are created in python? Give an example. (4)
- b) How do you create pandas series? Explain with syntax and example. (4)
- c) What is Broadcasting in numpy? Write three rules of Broadcasting. (4)
  
- 7. a) Explain any two types of inheritance with example. (4)
- b) How to create Pandas Dataframe from dictionary. Give example. (4)
- c) What is numpy? How numpy array is created? (4)

**UNIT – IV**

- 8. a) How do you draw barchart in python? Explain with example. (4)
- b) Explain features of matplotlib. (4)
- c) How to update data in MYSQL table using python. (4)
  
- 9. a) Explain piechart with an example using Matplotlib. (4)
- b) How to create line chart using Matplotlib. Give example. (4)
- c) How to delete data in MYSQL table using python. (4)

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(2021 Batch Onwards)

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**St Aloysius College (Autonomous)**

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**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**COMPUTER SCIENCE – V (b)**

**COMPUTER NETWORKS**

**Time: 2 ½ Hours.**

**Max Marks: 60**

**PART – A**

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

**(6x2=12)**

- Difference between broadcast network and a point to point network.
- What is Network topology?
- What is Framing?
- Define single bit error.
- What is broadcast routing?
- What is IP address? Give examples.
- Write the expansion of the following: FTP, HTTP, SMTP, DHCP.
- What is the difference between HTTP and HTTPS?

**PART – B**

**Answer any ONE FULL question from each unit.**

**(4x12=48)**

**UNIT - I**

- Explain ring and mesh topology. **(6)**
  - Explain in brief different layers of OST reference model. **(6)**
- Write a note on unicasting and multicasting. **(6)**
  - Differentiate OSI and TCP/IP reference model. **(6)**

**UNIT – II**

- List and explain the different services provided by the data link layer. **(4)**
  - Write a note on radio transmission. **(4)**
  - Generate the 7-bit Hamming Code for the 4-bit data word 1000. **(4)**  
Identify the parity bits.
- Consider the following message  $M=1010001101$ . Find the cyclic redundancy check (CRC) for this message using the divisor polynomial  $x^5+x^4+x^2+1$ . **(4)**
  - Explain a protocol using Go-Back-N. **(4)**
  - What is switching? Differentiate between circuit switching and packet switching. **(4)**

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**UNIT – III**

- 6. a) Explain link state routing with an example. (4)
- b) What are IP address classes and how do they determine the range of IP addresses within the network. (4)
- c) Explain the role and functioning of a router in a network. (4)
  
- 7. a) Explain the implementation of connection oriented service. (4)
- b) Explain the role and functioning of a switch in a network. (4)
- c) Write a note on design issues faced by the network layer. (4)

**UNIT – IV**

- 8. a) Write a note on DNS and WWW. (4)
- b) With a neat diagram explain user datagram protocol. (4)
- c) Explain elements of transport protocol. (4)
  
- 9. a) Explain the process of TCP connection release. (4)
- b) With a neat diagram explain TCP segment header. (4)
- c) Write a note on world wide web. (4)

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**B.Sc. - Semester V – Degree Examination**

**October/November - 2025**

**STATISTICS - V(a)**

**MATRIX ALGEBRA AND REGRESSION THEORY**

Time: 2 1/2 Hours.

Max Marks: 60

**SECTION - A**

**I. Answer any FIVE of the following: (5x2=10)**

1. Define inverse of a matrix and write its formula.
2. Briefly explain about the addition of two matrices.
3. Define the column rank of a matrix with an example.
4. Define quadratic form of a matrix.
5. Define Orthogonal transformation of a matrix.
6. Name three categories of variable selection methods.
7. Define hat matrix.

**SECTION - B**

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

8. a) Prove that for any square matrix with real elements  $A+A'$  is a symmetric matrix and  $A-A'$  is a skew symmetric matrix.  
b) State any five properties of determinants.
9. State and prove Jacobi's theorem.
10. Find the characteristic equation and the quadratic form of the given matrix.

$$A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 2 & -3 \\ 4 & -3 & 3 \end{bmatrix}$$

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11. a) Explain Box-Cox method of transformation.  
b) Explain normal probability plot.
12. a) State any five properties of least squares fit.  
b) Write a note on Violation of Normality in simple linear regression model.
13. a) Write a note on Homoscedasticity.  
b) Explain hypothesis testing on parameters in simple linear regression model.
14. a) Derive the expression for the estimator of parameters in simple linear regression models.  
b) Derive the expression for the estimator of variance in case of multiple linear regression models.

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**B.Sc. - Semester V – Degree Examination**

**October/November - 2025**

**STATISTICS - V(b)**

**Analysis of Variance and Designs of Experiment**

Time: 2 1/2 Hours.

Max Marks: 60

**SECTION - A**

**I. Answer any FIVE of the following: (5x2=10)**

1. Write the mathematical model for one way ANOVA.
2. Write the null and alternative hypothesis for two way ANOVA.
3. Define treatment and block in designs of experiment.
4. Write the mathematical model for RBD.
5. Define orthogonal contrast with an example.
6. State any two advantages of factorial experiment.
7. State any two applications of confounding.

**SECTION - B**

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

8. a) Briefly explain the fixed and random effect model.  
b) Prove that  $E(\text{MSST}) = \sigma^2$  in one-way ANOVA.
9. Deduce least square estimators of the parameters of three way model.
10. a) Stating the model split the total variation under two way classified data and obtain its components.  
b) Prove that  $E(\text{MSST}) = \sigma^2$  in LSD.
11. a) Write the ANOVA table of CRD.  
b) Derive expression for estimating two missing observation in case of LSD.
12. a) Define orthogonal contrast and mutually orthogonal contrast.  
b) Explain the statistical analysis of the  $2^2$  factorial experiments.
13. Explain the statistical analysis of  $2^3$  factorial experiments.
14. What is partial confounding? Explain how the statistical analysis can be carried out in case of complete confounding.

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**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**BOTANY – V(a)**

**PLANT TAXONOMY & RESOURCE BOTANY**

Time: 2½ hrs.

Max Marks: 60

Note: i) Answer all the sections.

ii) Draw diagrams wherever necessary.

**SECTION –A**

**I. Answer any FIVE of the following. (5x2=10)**

1. What is systematics?
2. What is Cytotaxonomy?
3. What is gynostegium?
4. What is a drupe?
5. Write two important characters of Convolvulaceae.
6. Write the features of fruits in Arecaceae.
7. Mention the scientific and family name of coffee.
8. What is Geological Indicator?

**SECTION –B**

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

1. Describe the procedure involved in processing of specimens for herbaria preparation.
2. What is Taxonomic Hierarchy? Describe with examples.
3. Mention any five salient features of Apiaceae.
4. Differentiate Papilionaceae from Mimosaceae.
5. Write a note on Verticillaster inflorescence.
6. Mention any five salient features of Euphorbiaceae.
7. How sugar is extracted?
8. Write the scientific, family name, parts used and two uses of clove and turmeric.

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**SECTION –C**

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

1. Mention the scientific, family name, distribution, part used and therapeutic uses of kokkum and nux-vomica.
2. Answer the following:  
a) Engler and Prantl system of classification b) Botanical gardens
3. Answer the following:  
a) Gynoecium in Annonaceae b) Cruciform corolla c) Fruit in Rutaceae  
d) Stamens in Ceasalpinia e) Calyx in Malvaceae
4. Write the salient features of Family Poaceae and give two scientific names of any two plants with economic importance.

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(2021 batch onwards)

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**BOTANY – V(b)**

**GENETICS AND PLANT BREEDING**

Time: 2½ hrs.

Max Marks: 60

Note: i) Answer all the sections.

ii) Draw diagrams wherever necessary.

**SECTION – A**

**I. Answer any FIVE of the following.**

**(5x2=10)**

1. Write the phenotypic and genotypic ratio of Monohybrid cross.
2. What is supplementary gene interaction?
3. What is a lethal mutation?
4. Mention any four applications of Polyploidy.
5. State any two differences in selection methods for self-pollinating and vegetative propagating crops.
6. What do you mean by plant introduction?
7. What is haploidy?
8. State any two differences between qualitative and quantitative inheritance.

**SECTION – B**

**II. Answer any SIX of the following.**

**(6x5=30)**

1. Mention the differences between linkage and crossing over.
2. Explain incomplete linkage in Maize.
3. Explain sex determination in *Asparagus*.
4. Define the term hyperploidy and explain trisomy in *Datura*.
5. Write a note on sexual mode of reproduction.
6. Define plant breeding. Write notes on the objectives of plant breeding.
7. Write a short note on ploidy breeding.
8. What is distant hybridization? Add a note on its advantages.

**SECTION – C**

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

**(2x10=20)**

1. What is hybrid vigour? Explain in detail.
2. Illustrate incomplete dominance in a specific plant species.
3. What are chemical mutagens? Explain any three types of Chemical mutagens
4. What is hybridization? Mention its types. Add a note on its advantages and limitations.

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(2021to 2023 batch)

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St Aloysius College (Autonomous), Mangaluru

B.Sc. Semester V - Degree Examination

October/November-2025

Zoology - Paper V(a)

**NON-CHORDATES AND ECONOMIC ZOOLOGY**

Time: 2 ½ hrs

Max Marks: 60

**Note:** 1. Answer any **ten** questions from Part-A, any **four** questions from Part- B and any **two** questions from Part-C.

2. Draw diagrams wherever necessary.

**PART-A**

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

**(10X2=20)**

- What are cnidocytes and what is their function?
- Describe Asconoid type of water canal system in sponges.
- Give any two functions of the nephridia in annelids?
- Mention the role of cilia in protozoans?
- Explain the molting in arthropods.
- Define the term Onychophora and Give an example.
- What is the scope of dairy industry?
- Name few examples of indigenous and exotic breeds used in poultry.
- How does water enter and exit the body of a sponge?
- List few examples of a polyp form of Cnidarian.
- Mention any two harmful Platyhelminthes and the damage they cause.
- What is the function of the setae in annelids?

**PART- B**

**II Answer any FOUR of the following**

**(4X5=20)**

- Write the distinguishing characteristics of the class crustacean.
- Discuss the evolutionary affinities of Hemichordates with Chordates and non-Chordates.
- Write a note on scope of Sericulture.
- Describe the economic importance of honey and bee wax.
- Discuss the adaptations of flatworms in human host.
- Explain the affinities of Ctenophora with other phyla, especially with Cnidaria.

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**PART- C**

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

**(2X10=20)**

- Compare and contrast the phylum Platyhelminthes and Nematelminths
- Discuss the classes of the phylum Mollusca highlight the distinguishing features of each class by providing suitable examples.
- Write a note on the steps involved in vermicomposting.
- Explain the rearing process of fishes.

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(2021 to 2023 batch)

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**St Aloysius College (Autonomous), Mangaluru**

**B.Sc. Semester V - Degree Examination**

**October/November-2025**

**Zoology - Paper V(b)**

**Chordates and Comparative Anatomy**

**Time: 2 ½ hrs**

**Max Marks: 60**

**Note:** 1. Answer any **ten** questions from Part-A, any **four** questions from Part- B and any **two** questions from Part-C.

2. Draw diagrams wherever necessary.

**PART-A**

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

**(10X2=20)**

- a) Substantiate the statement: "All vertebrates are chordates, but not all chordates are vertebrates."
- b) What is the primary defining characteristic of Cyclostomata? Give an example for cyclostome.
- c) What is the common name of Herdmania? Describe any physical features that contribute to this name.
- d) Name the scales found in Osteichthyes and Chondrichthyes?
- e) List two examples of reptiles in the order Squamata.
- f) Name any two examples of venomous snakes found in India.
- g) Define histology and its role in understanding animal tissues.
- h) List two differences between the digestive systems of herbivores and carnivores.
- i) State the function of visceral arches in vertebrates.
- j) Define autonomic nervous system.
- k) What are the two main types of photoreceptor cells found in the vertebrate eye?
- l) Draw a neat labelled diagram of a two chambered heart.

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**PART- B**

**II Answer any FOUR of the following**

**(4X5=20)**

- a) Analyse the differences between Lamprey and Hagfish.
- b) Describe the general characteristics of subphylum Cephalochordata , classify and give an example.
- c) Describe the classification of Amphibia up to the order level, including major characteristics of each order.
- d) Compare the distinctive features of mammalian brain.
- e) Give a brief account of the evolutionary trends observed in the body plans of animals.
- f) Describe the structure and function of the pronephros kidney in vertebrate evolution.

**PART- C**

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

**(2X10=20)**

- a) Analyze the general characters of vertebrates and discuss how these features are related to their adaptations to various environments.
- b) Mention the distinguishing features of two orders of birds with examples.
- c) Discuss in detail the major functions of the integumentary system in vertebrates.
- d) Describe the anatomy and function of lungs and associated structures in reptiles, birds and mammals.

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(2021 Batch Onwards)

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**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**MICROBIOLOGY – V(a)**

**MOLECULAR BIOLOGY**

Time: 2½ hrs.

Max Marks: 60

**Instructions: Draw Diagrams wherever necessary.**

**Answer all three sections- A, B, and C.**

**SECTION – A**

1. **Define/Answer any TEN of the following:** (10x2=20)
- What is the central dogma of molecular biology?
  - Define DNA repair.
  - Mention the phases of transcription.
  - State two key differences between DNA and RNA.
  - Function of aminoacyl tRNA synthetases.
  - Differentiate prokaryotic and eukaryotic translation termination factors.
  - List any two modes of horizontal gene exchange in bacteria.
  - Positive transcriptional control.
  - Direct repair.
  - cro* gene
  - What are exons and introns in RNA molecules?
  - Nonsense codons.

**SECTION – B**

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

- Explain the termination of translation in prokaryotes.
- Explain ubiquitination.
- Explain positive regulation in *lac* operon in detail.
- Outline generalised transduction.
- Write a note on Rho-dependent termination.
- Write a note on DNA polymerase III.

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**SECTION – C**

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

- Explain the process of transcription in prokaryotes.
- Explain the genetic code in detail.
- Discuss in detail the different types of DNA.
- Explain Griffith experiment.

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(2021 Batch Onwards)

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**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**MICROBIOLOGY – V(b)**

**FOOD MICROBIOLOGY**

Time: 2½ hrs.

Max Marks: 60

**Instructions: Draw Diagrams wherever necessary.**

**Answer all three sections- A, B, and C.**

**SECTION-A**

1. **Define/Answer any TEN of the following:** (10x2=20)
- Phycotoxins.
  - Mode of action of Botulinum toxin.
  - List any two extrinsic factors affecting food spoilage.
  - DMC.
  - What is the primary function of lactic acid starters?
  - List any four platform tests for milk.
  - Name the certification issued by BIS.
  - Give two examples of physical hazards in food products.
    - Pickling.
    - SCP.
    - Synbiotics
    - Sulfer stinker spoilage of canned food.

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**SECTION - B**

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

- Write a note on biopreservation.
- Discuss any two methods of packing milk and milk products.
- Outline food canning process.
- Which are the certifications provided by BIS and mention its importance?
- Discuss the causes and effects of proteolysis and rancidity in milk.
- Discuss Staphylococcal food poisoning.

**SECTION - C**

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

- Assess how different intrinsic factors affect microbial growth in food.
- Explain preservation of food by low temperature methods.
- Explain in detail MPN analysis.
- Discuss the steps involved in the application of HACCP.

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(2021 to 2023 Batch)

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**St Aloysius College (Autonomous), Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**BIOCHEMISTRY - V(a)**

**BIOCHEMISTRY OF MACROMOLECULES**

**Time: 2½ Hours**

**Max. Marks: 60**

**Note: i) Answer all the questions**

**ii) Draw diagrams wherever necessary**

**PART – A**

**1. Answer any FIVE of the following. (5×2=10)**

- Define epimers with an example.
- Why sucrose is a non-reducing sugar?
- How would you name an 18-carbon fatty acid with two double bonds at the 9th and 12th carbon?
- Write the biological role of phosphoglycerides.
- What is  $T_m$ ?
- Define zwitter ion.

**PART – B**

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

- Explain the cloverleaf model of tRNA.
- Write a note on glutathione.
- Discuss on the classification of carbohydrates with examples.
- Write a note on different forces that stabilize the structure of proteins.
- Write the structure of plasmalogens and cardiolipin.

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**PART – C**

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

- Explain the classification of lipids.
- Discuss the methods to determine N-terminal end of an amino acid.
- Explain Watson and Crick model of DNA.
- Discuss the structure, occurrence and biological significance of starch and glycogen.

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(2021 to 2023 Batch)

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B.Sc. Semester V – Degree Examination

October/November - 2025

BIOCHEMISTRY – V(b)

HUMAN PHYSIOLOGY AND ENZYMOLOGY

Time: 2½ Hours

Max. Marks: 60

Note: i) Answer all the questions

ii) Draw diagrams wherever necessary

**PART – A**

1. Answer any **FIVE** of the following. **(5×2=10)**

- Identify the three main types of blood vessels and briefly state their functions.
- Mentions any two roles of posterior pituitary gland.
- List the main classes of hormones based on their chemical structure.
- How would a decrease in blood pressure affect glomerular filtration?
- What is specific activity of an enzyme?
- List any two types of enzyme cofactors and give an example of each.

**PART – B**

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

- Comment on the hormonal regulation in menstrual cycle.
- Explain non-competitive inhibition.
- Illustrate the stages of extrinsic blood clotting pathway.
- Analyze how pH and temperature influence the binding affinity of hemoglobin for oxygen (Bohr effect).
- Comment on enzymatic degradation of carbohydrates.

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**PART – C**

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

- Explain the role of insulin and glucagon in maintaining blood sugar.
- Explain the factors that affects the rate of chemical reaction of an enzyme.
- Briefly explain transition theory of enzymes.
- Illustrate the acid-base balance in lungs.

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(2021 Batch onwards)

G 511 DC1.5

Reg. No.

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**BIOTECHNOLOGY – V(a)**

**Genetic Engineering**

**Time: 2½ Hours**

**Max. Marks: 60**

**Note: i) Answer all the questions**

**ii) Draw diagrams wherever necessary**

**PART - A**

1. **Answer any FIVE of the following:** **(5x2=10)**
- a) What is the primary function of DNA ligase?
  - b) What is the advantage of using YACs in genomic research?
  - c) Define gene knockout.
  - d) Define insertional inactivation
  - e) Name any two therapeutics produced using rDNA technology.
  - f) Name one application of Southern blotting technique.
  - g) Give an example of a protein structure analysis tool.
  - h) Name one advantage of synthetic biology over traditional genetic engineering.

**PART – B**

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

- 2. Explain the term 'isoschizomers' with suitable examples.
- 3. What are the various methods used to quantify DNA samples?
- 4. What are the key components of the CRISPR/Cas9 system?
- 5. Describe how liposomes are used for gene delivery.
- 6. Write short notes on SCID.
- 7. Give an account on reverse transcriptase PCR (RT-PCR).
- 8. Describe the safety protocols for handling genetically modified organisms in a laboratory setting.
- 9. Discuss the role of ethics committees in genetic engineering research.

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**PART – C**

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

- 10. Describe the structure and uses of plasmid vectors pUC19 and pBR322 in gene cloning.
- 11. Explain the principles and steps involved in creating a cDNA library.
- 12. Explain the steps involved in DNA fingerprinting.
- 13. Describe how genetic engineering is used to create superbug to degrade petroleum compounds.

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(2021 Batch onwards)

G 511 DC3.5

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**St Aloysius College (Autonomous)  
Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November - 2025**

**BIOTECHNOLOGY – V(b)**

**Plant and Animal Biotechnology**

**Time: 2½ Hours**

**Max. Marks: 60**

**Note: i) Answer all the questions**

**ii) Draw diagrams wherever necessary**

**PART - A**

1. **Answer any FIVE of the following:** (5x2=10)

- Write any two applications of embryo culture in plant tissue culture.
- Define secondary metabolites. Give an example.
- What are transgenic plants? Give an example.
- What is Flavr Savr Tomato?
- What is the purpose of using a hemocytometer in cell culture?
- Define multipotency in stem cells. Give an example.
- Define somatic gene therapy and provide one example.
- Which farm animals are commonly used as bioreactors?

**PART – B**

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

- Explain the process of cytodifferentiation in plant tissue culture, focusing on xylogenesis.
- Give an account on surface sterilization of explants in plant tissue culture.
- Explain the genetic modifications made in Golden Rice to increase Vitamin A content.
- Explain the process of biosafety assessment for transgenic plants.
- Describe the process of subculturing in animal cell culture and its significance.
- Explain the process of reprogramming somatic cells to create Induced Pluripotent Stem Cells.
- Describe the process of using silkworms as bioreactors for the production of heterologous proteins.
- Write short notes on transgenic animals.

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**PART – C**

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

- Explain the processes of meristem culture, and discuss their significance in producing virus-free plants.
- Describe various types of intellectual property rights and provide examples of each in the context of biotechnology.
- Explain the laboratory organization for animal cell culture.
- Discuss the process of cloning Dolly.

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**St Aloysius College (Autonomous)**  
**Mangaluru**  
**B.A./B.Sc. Semester V - Degree Examination**  
**October/November - 2025**  
**COMPUTER ANIMATION - V (a)**  
**3D TEXTURING, CAMERA AND LIGHTING**

Time : 2 ½ Hours

Max. Marks : 60

**SECTION - A**

Answer any **FIVE** of the following.

(5×2=10)

1. What is the use of giving set ID's?
2. How to apply materials to the object?
3. What is the use of bump map?
4. Which files we can import to Projector map?
5. How to disable the shadow only for one object?
6. How to increase the frames in timeline?
7. What is the use of unwrapping UVW?

**SECTION - B**

Answer any **FOUR** of the following.

(4×5=20)

8. Write down the steps of creating golden trophy.
9. Write a note on cameras & path constrain.
10. Explain the steps to create a rolling dice
11. Explain 4 types of video rendering options
12. What is the use of bump and gradient texture?
13. What is the difference between perspective view and camera view?

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**SECTION - C**

Answer any **TWO** of the following .

(2×15=30)

14. Explain different types of material shaders.
15. Explain all the options of hair and fur modifier.
16. Write a note on lights and its properties.

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**St Aloysius College (Autonomous)**  
**Mangaluru**  
**B.A./B.Sc. Semester V - Degree Examination**  
**October/November - 2025**  
**COMPUTER ANIMATION - V(b)**  
**WEB TECHNOLOGY**

Time : 2 ½ Hours

Max. Marks : 60

**SECTION - A**

Answer any **FIVE** of the following.

(5×2=10)

1. What is cellspacing and cellpadding used for?
2. What is the use of <ol> and <ul> tags?
3. Mention the tag used to import images in a webpage.
4. What is a Computer Network? Mention its 2 components
5. What was the previous names of the browser Firefox?
6. Name the tools used to slice the webpage into several sections
7. Define CSS and its structure.

**SECTION - B**

Answer any **FOUR** of the following.

(4×5=20)

8. What is Bootstrap? Explain some of its key features.
9. Write down the code to showcase 5 points each in ordered list and unordered list.
10. Create a gallery webpage with the help of HTML and CSS.
11. Write down the code for student login with HTML and CSS.
12. What is World Wide Web? Explain its unique features.
13. what are webbrowsers? Explain various browsers with pros and cons.

**SECTION - C**

Answer any **TWO** of the following .

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(2×15=30)

14. Create a navbar using HTML and CSS.
15. What are search engines? How do they work? Explain the key factors in ranking algorithms.
16. Write down the steps to create a carousel landing page with the help of bootstrap components.

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(2021 Batch Onwards)

G 513 DC1.5

Reg. No. :

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**Mangaluru**

**B.Sc. - SEMESTER V – Degree Examination**

**October/November - 2025**

**ECONOMICS – V(a)**

**PUBLIC ECONOMICS**

Time: 2½ Hours.

Max. Marks: 60

**SECTION - A**

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

1. Explain the term fiscal sustainability.
2. Define the principle of maximum social advantage.
3. What does intergenerational equity mean in the context of public debt?
4. How do public goods lead to the 'free-rider problem'?
5. Give the meaning of debt redemption.
6. Define budget in public finance.
7. Define indirect tax.
8. Name two sources of revenue for the government.

**SECTION - B**

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

9. Discuss the various methods of debt redemption.
10. What is meant by the free rider problem in the context of public goods?
11. Discuss the sources of public revenue.
12. Explain the process of budget preparation.
13. Explain the classical view on the burden of public debt.
14. Define a Public Good and list its two main characteristics.
15. Discuss the impact of taxation on distribution.
16. Discuss the causes of market failure.
17. Discuss the sources of public borrowing.

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**SECTION - C**

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

18. Discuss the impact of fiscal deficits on economic growth and fiscal sustainability.
19. Discuss the types and effects of public debt on a nation's economy.
20. Explain how the existence of externalities leads to market failure and the role of the government in correcting these failures.
21. Analyze the distinctions between public finance and private finance.

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**St Aloysius College (Autonomous)**  
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**B.Sc. - Semester V – Degree Examination**  
**October/November - 2025**

**ECONOMICS – V(b)**  
**INTRODUCTION TO R SOFTWARE**

Time: 2½ hrs.

Max. Marks: 60

**SECTION - A**

**I Answer any FIVE of the following.**

**(5×2=10)**

1. How do you insert data types as comments in R code?
2. `is.nan(myVector)` explain the function.
3. `A = A[-2, -1]` Explain the function.
4. State the syntax for accessing first and second row in the given 3x3 matrix.
5. 

```
A = matrix(  
  c( 12, 13, 14, 15, 16, 17,18,19,20),  
  nrow = 3,  
  ncol = 3,  
  byrow = FALSE  
)  
print(A[1, 2])
```

Write the output.

6. Write the command in R to replace an element in the matrix?
7. State the syntax for accessing first and second row in the given 3x3 matrix.
8. State any four features of R?

**SECTION - B**

**II Answer any SIX of the following.**

**(6×5=30)**

9. How to create mean imputation in the data set?
10. a) Distinguish between illegal and legal variables.  
b) What will be the output of the following R function?  

```
paste (Everybody, is, a, warrior)
```

  
c) Write a R code to convert integer to numeric.
11. a) Create and write a syntax for 3x3 matrix, dimension, number of columns and rows.  
b) Execute the output.
12. a) Write the syntax used to find the total number of characters in a given vector.  
b) Write the syntax used to change the string variable to uppercase and lower case.

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**Contd...2**

13. a) Syntax used to justify center.  
b) Syntax used to justify right.  
c) `my.var <- format(102.848793834, digits = 7)` what is the output?
14. Create and write syntax for a random data frame of 10 samples with variable gender (Male & Female) and age (11:26).
15. a) Create and write a syntax for 4x3 matrix, dimension, number of columns and rows.  
b) Execute the output.
16. `a=30, b=180`; write a valid syntax for if else statement in R.
17. `myVector <- c(NA, NA, NA, "TP", 4, 6.7, 'c', 1, 12, NA)` State the syntax for
  - a) Remove the missing value.
  - b) Identify the total number of missing value.
  - c) Position of the missing value.

### SECTION - C

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

**(2×10=20)**

18. `array1 = c(10,20,25)`  
`array2 = c(405,505,605,705,805,905,1005,1105)`
  - a) Write the code for 4x3 dimensions with 5 slice.
  - b) Write the output.
19. Describe the historical context of R programming.
20. A) `y = c(4,12,6,7,2,9,5)`  
Execute the result for the following syntax
  1. `order(y)`
  2. `y[order(y)]`
 B) `x <- c(8,2,4,1,-4,NA,46,8,9,5,3)`
  1. `order(x,na.last = TRUE)`
  2. `order(x,na.last=FALSE)``order(x,decreasing=FALSE,na.last=FALSE)`
21. Explain the following functions.  
`format(char,width,scientific,justify,nsmall,digits).`

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(2022 Batch Onwards)

G 513 DC4.5

Reg. No. :

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. - Semester V – Degree Examination**

**October/November - 2025**

**ECONOMICS – V(c)**

**INDIAN BANKING AND FINANCE**

Time: 2½ hrs.

Max Marks: 60

**SECTION - A**

**I Answer any FIVE of the following.**

**(5×2=10)**

1. According to Crowther who are the three ancestors of banking?
2. Give the meaning of foreign bank.
3. Distinguish between commercial banks and payment banks.
4. Give the meaning of KYC.
5. What are the components of bank loan?
6. Give the meaning of direct lending.
7. Distinguish between a bond and equity share.
8. Distinguish between money market and capital market.

**SECTION – B**

**II Answer any SIX of the following.**

**(6×5=30)**

9. Briefly explain the structure of Indian banking.
10. Write a note on NPA crisis.
11. Briefly explain loan default and its consequences.
12. Write a note on E- banking.
13. Briefly explain the concept of credit score.
14. Write a note channel of remittance.
15. Write a note on investment banking.
16. Briefly explain the various modern banking products.
17. Write a note on the functions and instruments of capital market.

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**SECTION – C**

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

**(2×10=20)**

18. Explain the functions of commercial banks.
19. Explain the types of bank loans. What are the documents required and eligibility criteria for bank loan.
20. Explain the various modern banking facilities.
21. Explain the origin, objectives, structure and functions of SEBI.

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(2021 Batch Onwards)

G 514 DC1.5

Reg. No. : 

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**St Aloysius College (Autonomous)**

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**B.Sc. Semester V – Degree Examination**

**October/November – 2025**

**FOOD SCIENCE – V(a)**

**INTRODUCTION TO DAIRY & FERMENTATION TECHNOLOGY**

**Time: 2½ Hours**

**Max. Marks: 60**

**Note: i) Answer all the questions**

**ii) Draw diagrams wherever necessary**

**PART – A**

1. **Answer any FIVE of the following.** **(2×5=10)**
- a) Expand AMUL.
  - b) Define Homogenisation of milk.
  - c) Define indigenous dairy products.
  - d) What is ghee, and how is it different from butter?
  - e) List out the applications of microbial growth curve in Industries.
  - f) List out the steps involved in preparation of fermented food products.
  - g) What are Hops? Why are they added during Bee processing.

**PART – B**

**Answer any SIX of the following.** **(5X6=30)**

- 2. Describe the steps involved in Red wine processing methods.
- 3. Explain the working principle of reverse osmosis in milk processing.
- 4. Define milk and write a note on milk types.
- 5. Explain the step-by-step method for preparing Paneer at home.
- 6. Explain how microbial contamination can lead to defects in milk products. Provide an example.
- 7. Give an account on preparation of Dhokla and Shrikhand.
- 8. Write about a) Impeller b) Baffles in a fermenter.
- 9. Differentiate between microfiltration and ultrafiltration.

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**PART – C**

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

- 10. Elaborate on downstream processing. Discuss on its advantages and its limitations and its importance.
- 11. Discuss the importance and need for utilization of milk industry by-products.
- 12. Explain on UHT processing and aseptic packaging of milk.

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(2021 Batch Onwards)

G 514 DC3.5

Reg. No. :

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**St Aloysius College (Autonomous)**

**Mangaluru**

**B.Sc. Semester V – Degree Examination**

**October/November – 2025**

**FOOD SCIENCE – V(b)**

**SPICES AND PLANTATION CROP TECHNOLOGY**

Time: 2½ Hours

Max. Marks: 60

Note: i) Answer all the questions

ii) Draw diagrams wherever necessary

**PART – A**

1. Answer any **FIVE** of the following. (2×5=10)
- How does spice processing enhance the shelf life of spices?
  - What are the major chemical components of Clove and Pepper?
  - Give the importance of slicing during ginger processing.
  - Give the importance of spices.
  - What is Dutching in cocoa processing?
  - Why is Boiling carried out in Arecanut processing?
  - Mention any two spices commonly used for essential oil extraction.

**PART – B**

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

- Compare the orthodox and CTC method of Tea processing.
- Give the importance of spices and spice processing.
- Explain the processing of cloves.
- Explain Cryogenic grinding of spices.
- Discuss on Milling process of Spices and its Importance.
- Explain the steps involved in processing of Cashewnuts.
- Explain Wet Processing method of Coconut Processing.
- Write short notes on the extraction of essential oils by any 2 methods.

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**PART – C**

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

- Discuss the processing of vanilla with a flowchart.
- Explain the steps involved in coffee processing (wet method). Write a note on Instantization and Agglomeration.
- Explain Turmeric Processing in detail.

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(2022-2023 Batch)

G 701 DC1.5

Reg. No.

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**St Aloysius college (Autonomous), Mangaluru**

**B.Sc.(Visual Communication) Semester V – Degree Examination  
October/November- 2025**

**Development Communication**

Time: 2½ hrs.

Max Marks: 60

**SECTION - A**

**Write short note in 2 to 3 sentences on any FIVE of the following (5x2=10)**

1. Summarize the role of community engagement in the Participatory Model of development.
2. What are magic multipliers and mobility multipliers?
3. What is the definition of folk media, and how is it different from Information and Communication Technology (ICT)?
4. What is the Green Revolution, and how did it impact Indian agriculture?
5. Explain e-governance?
6. Give an example of how cultural factors contribute to social change in a society.
7. How can social media be utilized to promote awareness of development issues in India?

**SECTION - B**

**Answer any FOUR of the following in 100 – 150 words each (4x5=20)**

8. Compare and contrast the ethical issues faced in-development reporting with those in general journalism.
9. Explain the causes of social change?
10. What specialized skills are essential for a development tourist? Illustrate with examples.
11. Explain Governmental and Non-Governmental organization with examples?
12. Compare any two development models in term of the approach in development?

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**SECTION - C**

**Write a detailed note on any TWO of the following in 500– 700 words each (2x15=30)**

13. Explain Development paradigm in the context of development communication?
14. Discuss the challenges and opportunities of using ICT for rural development?
15. What is the contribution of Everett M. Rogers to development communication?

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(2022-2023 Batch)

G 701 DC2.5

Reg. No.

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**St Aloysius College (Autonomous), Mangaluru**

**B.Sc.(Visual Communication) Semester V – Degree Examination**

**October/November- 2025**

**Television Programme Production**

**Time: 2½ hrs.**

**Max Marks: 60**

**SECTION - A**

**Write short note in 2 to 3 sentences on any FIVE of the following (5x2=10)**

1. Who is credited with the invention of the television?
2. What is Aspect Ratio?
3. Which are the different lights used in TV Studio
4. State the difference between a close-up shot and a wide shot
5. What is the primary advantage of using compressed video formats for online streaming?
6. What are the basic components of a video camera?
7. What are the three main production stages in television production?

**SECTION - B**

**Answer any FOUR of the following in 100 – 150 words each (4x5=20)**

8. Discuss the advantages of using a single-camera setup in filmmaking. When is this method most appropriate?
9. Evaluate the challenges and benefits of producing live television shows compared to pre-record show.
10. Identify and discuss the characteristics of reality TV and why it has gained popularity.
11. How does lighting influence the mood and meaning of a visual scene?
12. Explain how the choice of screen format can impact the storytelling and composition of a video

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**SECTION - C**

**Write a detailed note on any TWO of the following in 500– 700 words each (2x15=30)**

13. Define the terms "screen Direction ", 180 degree ", and "30 degree rule". Provide brief explanation of their significance in Television production.
14. Explain the various types of camera shot in Television production with example.
15. Explain the difference between single –camera and multi –camera production techniques in Television.

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(2022-2023 Batch)

G 701 DC3.5

Reg. No.

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**St Aloysius College (Autonomous), Mangaluru**

**B.Sc.(Visual Communication)-Semester V– Degree Examination**

**October/November- 2025**

**Cinematography and Lighting**

**Time: 2½ hrs.**

**Max Marks: 60**

**SECTION - A**

**Write short note in 2 to 3 sentences on any FIVE of the following (5x2=10)**

1. Roundhay Garden
2. Cinematographer
3. Diffuser
4. Two Shot
5. Cinematographer
6. Key Light
7. Wes Anderson

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**SECTION - B**

**Answer any FOUR of the following in 100 – 150 words each (4x5=20)**

8. Define soft light and hard light, and explain the main differences between them.
9. Differentiate between cinematography and videography, focusing on their purpose and techniques.
10. What are the key responsibilities of a cinematographer in a film production?
11. Define a pan and describe its basic function in a scene.
12. How does a Dutch angle contribute to creating tension or unease in a scene?

**SECTION - C**

**Write a detailed note on any TWO of the following in 500– 700 words each (2x15=30)**

13. If the lighting is too harsh on a subject, how would you apply diffusion techniques to soften the light?
14. Explain how the angle and direction of light can be used to create depth in a scene.
15. Explain the role of stabilization techniques such as tripod, steadicam, dolly and crane in cinematography.

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