

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)
Sub_Code: 23ES1005

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: Basic Civil Engineering

BRANCH(S): AE, AEIE, AIML, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CS, CSE, CSE(CS), CSEAI, CSEAIML, CSEDS, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: V744

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- Name four major disciplines of civil engineering.
- State the two major functions of foundation of a structure.
- Write two uses of stones.
- Distinguish between coarse aggregates and fine aggregates.
- Name two different types of composites used as construction material.
- Name the five ingredients of concrete.
- Define the term "per capita demand".
- Mention two applications of timber.
- Define "ultimate bearing capacity of soil".
- State the function of filtration unit in water treatment process.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- State various requirements of a residential building.
- Write about different types of Glasses used in construction.
- Explain the terms with neat sketch: strip footing, isolated footing, and combined footing.
- Provide a detailed classification of bricks as per Indian standards.
- State the basic requirements of urban roads.
- Write about the working principle of sedimentation aided with coagulation.
- Provide a layout of public water supply system with help of neat sketches.
- State the advantages and disadvantages of flexible pavements over rigid pavements.
- Mention about the purpose of construction of dams in irrigation projects.
- Write short note on "plastics as construction material".
- Illustrate importance of interdisciplinary approach in the development of infrastructures.
- Explain the terms with examples: adhesives, paint, and mortar.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Provide a detailed classification of: (a) highways (b) urban roads as per Indian system. (16)
- Q4** Summarize in detail by providing the layout of canal irrigation system with neat sketches. Also write a short note on multi river valley projects. (16)
- Q5** Explain about the various modes of transportation: highway, railway, waterways, pipe and conveyor. (16)
- Q6** Describe about different types of cements used in construction industry. (16)

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub_Code: 23ES1001

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: Basic Electrical Engineering

BRANCH(S): AE, AEIE, AERO, AIML, AME, AUTO, BIOTECH, CHEM, CIVIL, CS, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MECH, METTA, MINERAL, MINING, MME

Time: 3 Hours

Max Marks: 100

Q.Code: V595

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

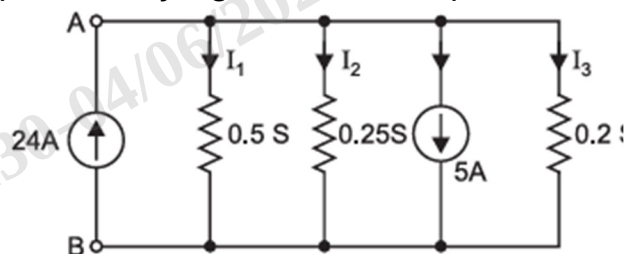
- Mention two elements of each active and passive element.
- Find current using Ohm's law if Thevenin equivalent is $V_{th} = 12\text{ V}$, $R_{th} = 4\ \Omega$ and load = $2\ \Omega$.
- Draw the symbol for dependent and independent voltage source.
- A source has internal resistance $8\ \Omega$. What should be the load resistance for maximum power transfer from the source? Justify your answer.
- Find reactive power, if apparent power is 1000 VA and power factor is 0.8 .
- A magnetic path has length 0.4 m , area of cross section 0.002 m^2 , permeability $\mu = 1.2 \times 10^{-3}\text{ H/m}$. Find reluctance.
- What is the purpose of laminating the core in a transformer?
- Mention the status of sleep in a 3-phase induction machine depending on the operating modes like motoring, generator, and braking.
- What is the role of transformers in a power system?
- Mention the type of distribution systems.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

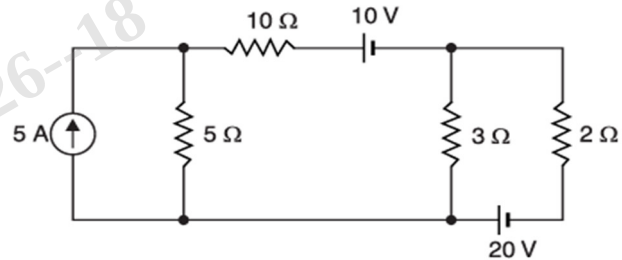
(6 x 8)

- a) Find the three branch currents in the circuit shown in the figure. What is the potential difference between points A and B?

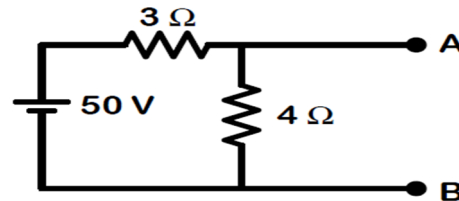


- A series circuit has $R = 10\ \Omega$, $L = 50\text{ mH}$ and $C = 100\ \mu\text{F}$ and is supplied with source of 200 V , 50 Hz . Find and examine the value of: (i) Impedance (ii) Current (iii) Power
- Derive EMF equation of a single-phase transformer.
- A 20 kVA , $2200/220\text{ V}$, 50 Hz transformer has 66 secondary turns. Calculate the number of primary turns and primary and secondary rated currents. Neglect losses.

- e) Explain the construction and working principle of 3 phase induction motor.
- f) Find the current in and voltage across $2\ \Omega$ resistor in the circuit below, use any method.



- g) Find the Thevenin's equivalent circuit across AB for the circuit shown below



- h) The back emf of Shunt motor is 227 V. The field resistance is $150\ \Omega$ and field current 1.5 A. If the line current is 36.5 A, find the armature resistance also find armature current when the motor is stationary.
- i) A conductor of length 100 cm and carrying 100 A is situated in and at right angles to a uniform magnetic field of strength $1\ \text{Wb/m}^2$. Calculate the force and power required to move the conductor at a speed of 100 m/s in a plane at right angles to the magnetic field.
- j) Explain the need for high-voltage transmission and its advantages.
- k) Explain in brief about different sources of electrical power.
- l) Give the line diagram of a typical generation, transmission, and distribution scheme with proper labeling.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Draw the circuit model of Different types of DC Generator and give the Generated emf equations in terms of the machine parameters. (16)
- Q4** A magnetic circuit made of wrought iron is arranged as shown in Fig below. The central limb has a cross-sectional area of $8\ \text{cm}^2$ and each of the side limbs has a cross-sectional area of $5\ \text{cm}^2$. Calculate the ampere-turns required to produce a flux of $1\ \text{mWb}$ in the central limb, assuming the magnetic leakage is negligible. Given that for wrought iron (from B-H curve), $H = 500\ \text{AT/m}$ at $B = 1.25\ \text{Wb/m}^2$ and $H = 200\ \text{AT/m}$ at $B = 1\ \text{Wb/m}^2$. (16)
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- Q5** Explain in detail about (i) RMS value, (ii) Average value, (iii) Form factor, (iv) Peak factor and prove that the form factor of the sinusoidal wave is 1.11 (16)
- Q6** Explain the measurement of three phase power using two wattmeter method. (16)

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub_Code: 23ES1002

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: BASIC ELECTRONICS

BRANCH(S): AE, AEIE, AERO, AG, AI, AIML, AME, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, CSE(CS), CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, IT, MANUTECH, MECH, METTA, MINING, MME, MMEAM, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: V597

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- What is diffusion current in a semiconductor?
- A silicon diode carries a current of 20 mA at room temperature. Find the dynamic resistance of the diode.
- Why is a CE transistor configuration widely used in amplifiers?
- Define operating point (Q-point) of a transistor.
- What is the β value of a BJT for $\alpha = 0.97$?
- An amplifier has voltage gain 200 and feedback factor 0.02. Find the gain with feedback.
- State DeMorgan's theorems.
- Convert the numbers $(1110101)_2 = (\quad)_{10}$ and $(7B.4)_{16} = (\quad)_8$
- Prove the Boolean Identity, $(A+B)(A'+C) + AC = AC + BC$
- Define modulation index in AM.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- Determine V_0 , I , I_{D1} , I_{D2} and I_{D3} for the parallel diode configuration as in Fig. 1.

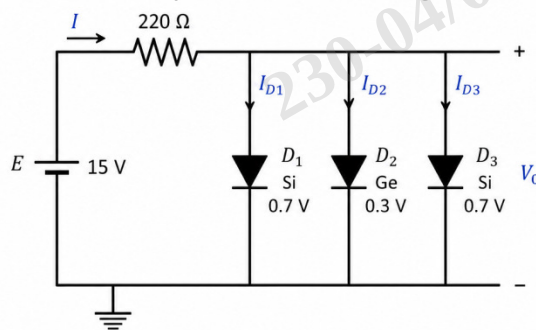


Fig. 1

- b) Explain the input and output characteristics of an n-channel JFET. Define pinch-off voltage and trans conductance.
- c) In a fixed bias Silicon n-p-n transistor (CE) circuit with $\beta = 100$, $V_{CC} = +18V$, $R_C = 2.2 K\Omega$, $R_B = 470 K\Omega$ are used. Find I_{BQ} , I_{CQ} , V_{CEQ} , V_C , V_B , and V_E .
- d) A half-wave rectifier operates from a 230 V, 50 Hz supply using a transformer of turns ratio 10:1. If load resistance is 1 k Ω , calculate: Peak load current, DC output current, Ripple factor, Rectification efficiency.
- e) Explain the four types of feedback topologies with suitable block diagrams. State one application of each.
- f) The drain current of a JFET is 8 mA at $V_{GS} = 0V$. The pinch-off voltage is $-4V$. Calculate the drain current when $V_{GS} = -2V$.
- g) Design an inverting amplifier using OP-AMP having voltage gain of -50 using suitable resistor values.
- h) An amplifier without feedback has gain 500. Negative feedback reduces distortion by 5 %. Determine: Feedback factor and gain with feedback
- i) Simplify: $[(A + B') (A' + C)] + [(A + B) (B + C')]$
- j) Perform the following:
 - I. $(57)_{10} + (29)_{10}$ using binary addition
 - II. Find 1's complement and 2's complement of $(110101)_2$
- k) Explain the principle of amplitude modulation. Derive the expression for AM wave and modulation index.
- l) Describe the working principle of Digital Storage Oscilloscope (DSO). Mention its advantages over CRO.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 A Silicon Diode having 50 Ω internal resistance is used as half wave rectifier. If the applied input voltage is $100 \sin(100\pi t)$ and load resistance is 1 K Ω , then find (i) I_M , (ii) I_{DC} , (iii) I_{RMS} , (iv) Output Frequency, (v) Ripple factor, (vi) AC Input power, (vii) AC Output Power, and (viii) Efficiency. (16)
- Q4 a) Draw and explain the drain and transfer characteristics of Enhancement MOSFET. (8)
 b) Design a summing amplifier using OP-AMP to obtain: $V_o = -(2V_1 + 3V_2)$ (8)
- Q5 a) An OP-AMP has: Open loop gain $A = 2 \times 10^5$, Common mode gain $A_c = 0.02$. Find: CMRR and CMRR in dB (8)
 b) Find the complement of $F = wx + yz$, then show that $FF' = 0$ and $F + F' = 1$. (8)
- Q6 a) Given the AM signal equation $x(t) = (20 + 4\sin(500\pi t)) \cos(2\pi \times 10^5 t)$, calculate (I) Carrier power (P_C), (II) Total Power, and (PI) (III) Sideband power. (8)
 b) What is Frequency modulation? Derive the mathematical representation of a frequency-modulated signal. (8)

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub_Code: 23ES1006

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: BASIC MECHANICAL ENGINEERING

BRANCH(S): AE, AEIE, AERO, AG, AI, AIML, AME, AUTO, BIOTECH, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MECH, METTA, MINING, MME, MMEAM

Time: 3 Hours

Max Marks: 100

Q.Code: V746

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Differentiate between intensive and extensive properties.
- State the Zeroth Law of Thermodynamics.
- Mention the limitations of the First Law of Thermodynamics.
- Define entropy. Mention its physical significance.
- Differentiate between SI and CI engines.
- State Pascal's law.
- Classify engineering materials.
- What are the limitations of casting?
- What are the advantages of gear drives over belt drives?
- What is the function of a clutch?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Discuss the Kelvin–Planck and Clausius statements of the Second Law of Thermodynamics.
- Define the following terms in thermodynamics: state, process, path, and cycle with suitable examples.
- 1 m³ gas is compressed to 0.5 m³ at constant pressure of 100 kPa. During the process 40 kJ of heat transferred from the gas. Calculate change in internal energy of gas.
- Explain the working principle of a four-stroke petrol engine with suitable diagrams.
- What is capillarity? Deduce the expression for rise or fall of liquid in a capillary tube.
- Discuss the terms 'vapor pressure' and 'cavitation' in fluid mechanics.
- Describe the steps involved in sand casting process with neat diagrams.

- h) Mention the reasons for the following physical actions:
- (i) Water droplets are spherical in shape.
 - (ii) Golf balls are dented throughout over the entire surface.
 - (iii) Fins are provided on automobile radiators.
 - (iv) Heat engines with 100 % thermal efficiency are not possible to design.
 - (v) Lubrication is very important in engines.
 - (vi) Sand is commonly used in preparation of moulds.
- i) Discuss common casting defects and remedies.
- j) Explain the principle and applications of arc welding.
- k) Explain the construction and working principle of a clutch.
- l) Compare mechanical brakes and hydraulic brakes.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Compare heat engines, refrigerators, and heat pumps based on working principles, objectives, and performance parameters. (8 + 8)
- b) Fluid enters a nozzle with a velocity of 40 m/s and initial enthalpy is 4000 kJ/kg. The enthalpy of fluid at the exit of nozzle is 3000 kJ/kg. Assume that there is no heat interaction between nozzle and surroundings. Calculate (i) velocity of fluid at exit of the nozzle, (ii) the mass flow rate when inlet area is 0.1 m² and specific volume at inlet is 0.1 m³/kg, and (iii) the exit area of nozzle when the specific volume at the nozzle exit is 0.5 m³/kg.
- Q4** a) Explain the different modes of heat transfer with suitable examples. (8 + 8)
- b) A piston of 840 mm diameter and 260 mm long works in a cylinder of 800 mm diameter. If the annular space is filled with a lubricating oil of viscosity 5 cP, calculate the speed of descent of piston in vertical position. The weight of the piston and the axial load are 9.8 N.
- Q5** a) Discuss the mechanical and physical properties of engineering materials. (8 + 8)
- b) Explain the defects in welding and methods to prevent them.
- Q6** a) Explain the working principle of gear drives and their applications. (8 + 8)
- b) Explain the role of robots in industrial automation.

Registration No.:

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Total Number of Pages: 03

Course: B.Tech/IDD (B.Tech & M.Tech)
Sub_Code: 23BS1003

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: Chemistry

BRANCH(S): AE, AEIE, AERO, AI, AIML, AME, AUTO, BIOTECH, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, IT, MANUTECH, MECH, METTA, MINING, MME, MMEAM, PLASTIC, PT

Time: 3 Hours

Max Marks: 100

Q.Code: V520

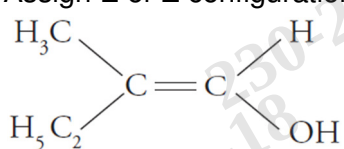
Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1

Answer the following questions:

(2 x 10)

- Define effective nuclear charge (Z_{eff}). How is it related to actual nuclear charge and shielding?
- What is the inert pair effect? Give one example.
- Calculate the entropy change when 2 moles of an ideal gas expand isothermally and reversibly from 10 L to 50 L at 300 K.
- For a reaction, $\Delta H = -100 \text{ kJ}$ and $\Delta S = -200 \text{ J K}^{-1}$ at 298 K. Calculate ΔG and predict whether the reaction is spontaneous.
- For a diatomic molecule, the rotational spectral lines are equally spaced with separation $2B = 4 \text{ cm}^{-1}$. Calculate the rotational constant.
- Why is HCl IR active but H_2 is not?
- Calculate the total number of optical isomers for 2,3-dichloropentane and write the structure of each isomer.
- Assign E or Z configuration to the following compound:

- Arrange the following carbocations in increasing order of stability and give a reason: CH_3^+ , $(\text{CH}_3)_2\text{CH}^+$, $(\text{CH}_3)_3\text{C}^+$, CH_3CH_2^+ .
- Why tertiary alkyl halides undergo SN_1 reactions readily, whereas methyl halides do not?

Part-II

Q2

Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- What is polarisation of an anion by a cation? State and explain Fajan's rules with suitable examples. How does polarisation affect the covalent character and melting points of ionic compounds?
- Define electronegativity. Describe the Pauling scale and the periodic trends in electronegativity. Explain any two applications of electronegativity.

- c) Explain the variation of atomic radii across a period and down a group with suitable examples. Discuss the phenomenon of lanthanide contraction and its consequence on the sizes of third-row d-block elements.
- d) Derive the van't Hoff isochore. Using this equation, calculate the equilibrium constant at 500 K for a reaction if $K = 10$ at 400 K and $\Delta H = 50 \text{ kJ mol}^{-1}$ (assume ΔH constant over the temperature range).
- e) Derive an expression for the entropy of mixing of ideal gases. Calculate the entropy change when 2 moles of N_2 and 3 moles of O_2 are mixed at constant temperature and pressure.
- f) Derive the expression for rotational energy levels of a rigid diatomic molecule and show that rotational spectral lines are equally spaced with separation $2B$. Calculate the moment of inertia and bond length of CO given that the first rotational line ($J = 0 \rightarrow 1$) appears at 3.8424 cm^{-1} .
- g) Discuss the types of molecular vibrations with diagrams. Write the expression for vibrational frequency. Calculate the approximate IR absorption frequency (in cm^{-1}) for C=O bond if force constant $k = 1 \times 10^6 \text{ dynes/cm}$.
- h) Describe the various conformations of n-butane obtained by rotation around the C2–C3 bond. Draw Newman projections for anti, gauche, and eclipsed conformations. Why is the anti-conformation the most stable?
- i) Explain why compounds with an asymmetric carbon atom are optically active. How many optical isomers are possible for a compound with three different chiral carbons (unsymmetrical)? Discuss the difference between diastereomers and enantiomers with an example.
- j) What are the essential conditions for geometrical isomerism? Explain the E-Z system of nomenclature with suitable examples. Assign E/Z to the following:
 - (i) $(\text{CH}_3)(\text{C}_2\text{H}_5)\text{C} = \text{C}(\text{CH}_3)(\text{Br})$
 - (ii) $(\text{Cl})(\text{Br})\text{C} = \text{C}(\text{I})(\text{F})$
- k) Explain the mechanism of electrophilic addition of HBr to an unsymmetrical alkene (propene) following Markovnikov's rule. How does the addition of HBr in the presence of peroxide differ? Discuss this with mechanism.
- l) What is a free radical? Mention its hybridization and geometry. Discuss the stability of free radicals with reference to hyperconjugation and resonance with suitable examples.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3

- a) Define ionization enthalpy. Discuss the periodic trends in ionisation enthalpy across a period and down a group with suitable examples. (6+4+2+4)
- b) Explain the following exceptions in the second period:
 - i. Ionisation enthalpy of Be is higher than that of B
 - ii. Ionisation enthalpy of N is higher than that of O.
 How do effective nuclear charge (Z_{eff}) and penetration effect influence these trends?
- c) Explain why the first ionisation enthalpy of Na is lower than that of Mg, but its second ionisation enthalpy is higher than that of Mg.
- d) Define isoelectronic species. Considering the isoelectronic series: O^{2-} , F^- , Na^+ , Mg^{2+} , Al^{3+} , explain the trend in ionisation enthalpy across this isoelectronic series.

- Q4** a) Derive the Clausius-Clapeyron equation and Integrated form of this equation for liquid-vapour equilibrium starting from the fundamental thermodynamic relations. (8)
- b) A liquid has a vapour pressure of 400 mm Hg at 350 K and 800 mm Hg at 370 K. Calculate its molar enthalpy of vaporisation (ΔH_v) and its vapour pressure at 360 K. (4)
- c) The free energy change for a reaction is -86.5 kJ per mole at 298 K and -83.50 kJ per mole at 308 K. Calculate the enthalpy change (ΔH) for the reaction at 303 K. (4)
- Q5** a) State and derive the Beer-Lambert law. Explain the terms absorbance, transmittance, and molar absorptivity. (6)
- b) A solution of a compound in a 2 cm cell shows an absorbance of 0.6 at a wavelength where $\epsilon = 1500 \text{ dm}^3 \text{ mol}^{-1} \text{ cm}^{-1}$. Calculate the concentration of the solution. (2)
- c) Discuss the four types of electronic transitions ($\sigma \rightarrow \sigma^*$, $n \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$) with suitable examples and their relative energy order. (4)
- d) Describe the Franck-Condon principle and its significance in electronic spectroscopy. (4)
- Q6** a) Describe the mechanisms of nucleophilic substitution reactions – SN1 and SN2 – using suitable examples. Compare them with respect to: (14)
- (i) Kinetics and rate law
 - (ii) Stereochemistry
 - (iii) Effect of substrate structure
 - (iv) Effect of nucleophile
 - (v) Effect of solvent polarity
- b) Explain why tert-butyl bromide reacts faster than methyl bromide in SN1 but slower in SN2. (2)

Registration No.:

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Total Number of Pages: 02

B.Tech/IDD (B.Tech & M.Tech)
23ES1004

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: Engineering Mechanics

BRANCH(S): AE, AEIE, AERO, AI, AIML, AME, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CS, CSE, CSE(CS), CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, IT, MANUTECH, MECH, METTA, MINING, MME, MMEAM, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: V668

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Distinguish between resolution of forces and composition of forces.
- Define angle of friction and angle of repose. State the relation between them.
- Define the principle of virtual work and state any two applications.
- What is a couple? State the characteristics of a couple.
- What are the assumptions made, while finding out the forces in the various members of a Truss structure?
- State the two theorems of Pappus and Guldinus.
- State the relation of moment of inertia of a triangular section of base (b) and height (h) about an axis through its c.g. and parallel to the base.
- What is D'Alembert's principle in curvilinear motion?
- A particle starts from rest and moves with acceleration $a(t) = 4t \text{ m/s}^2$. Find its velocity at $t = 3 \text{ s}$.
- A projectile is fired at 45° with a muzzle velocity of 200 m/s . Find the maximum height and time of flight.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Three concurrent forces of 200 N , 300 N , and 150 N act at angles of 0° , 60° , and 150° respectively from the positive x-axis. Determine the magnitude and direction of the resultant.
- A square ABCD has sides equal to 200 mm . Forces of 150 N each act along AB and CD and 250 N act along CB and AD. Find the moment of the couple, which will keep the system in equilibrium.
- A block of mass 45 kg rests on a horizontal surface ($\mu = 0.3$). Find the force required to (i) slide the block horizontally, and (ii) move the block up a 30° incline.
- Find the centroid of an L-section (unequal angle) with flanges: horizontal $100 \text{ mm} \times 15 \text{ mm}$ and vertical $80 \text{ mm} \times 12 \text{ mm}$, with the bottom flange on the x-axis.
- Determine the moment of inertia of a T-section (flange $150 \text{ mm} \times 20 \text{ mm}$, web $120 \text{ mm} \times 12 \text{ mm}$) about its centroidal horizontal axis.

- f) Find the centroid of a semicircular section having outer and inner diameters of 200 mm and 160 mm respectively as shown in Fig. 1.

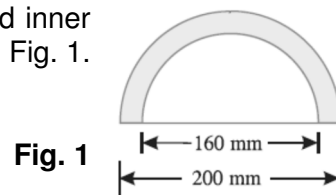


Fig. 1

- g) Derive an expression for the moment of inertia of a rectangular section about an horizontal axis passing through the base of the rectangular section.
- h) With a suitable example, explain the method of sections and determine the forces in the members.
- i) A flywheel rotating at 300 rpm is brought to rest in 30 seconds with uniform deceleration. Find (i) angular deceleration and (ii) number of revolutions made before coming to rest.
- j) A block of mass 20 kg is pushed from rest and reaches a velocity of 15 m/s over 5 s on a surface with $\mu = 0.2$. Find the applied force using D'Alembert's principle.
- k) A ball of mass 2 kg moving at 10 m/s collides head-on with a stationary ball of mass 3 kg. If $e = 0.7$, find the velocities after impact and energy lost.
- l) A particle moves in a curved path described by $x = 4t^2$ and $y = 5t^3$ (in meters and seconds). Find the velocity, acceleration, and the radius of curvature at $t = 5$ seconds.

Part-III

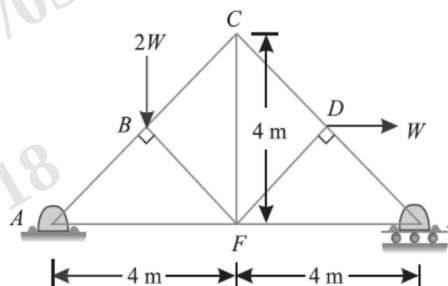
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3

Find the forces in all the members of the truss (Fig. 2), indicating whether the force is compressive or tensile.

Fig. 2

(16)

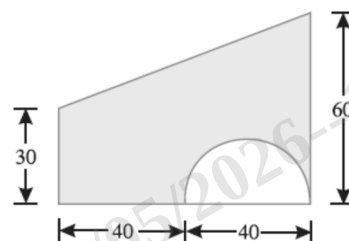


Q4

A semicircular area is removed from a trapezium as shown in Fig. 3 (dimensions in mm). Determine the centroid of the remaining area.

Fig. 3

(16)

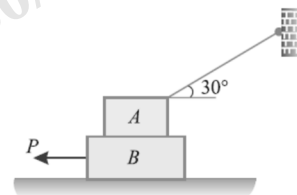


Q5

Two blocks A and B of weights 2 kN and 4 kN respectively are in equilibrium position as shown in Fig. 4. If the coefficient of friction between the two blocks as well as the block B and the floor is 0.2, find the force (P) required to move the block B.

Fig. 4

(16)



Q6

A system of two blocks connected by a string over a frictionless pulley: block A (mass 40 kg) on a 30° inclined plane ($\mu = 0.3$) and block B (mass 20 kg) hanging vertically. Find the acceleration of the system and the tension in the string using D'Alembert's principle.

(16)

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)
Sub_Code: 23HS1002

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: English for Technical Writing

BRANCH(S): AE, AEIE, AERO, AI, AIML, AME, AUTO, BIOMED, BIOTECH, CIVIL, CSE, CSE(CS), CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ENV, ETC, IT, MECH, METTA, MINING, MME, MMEAM

Time: 3 Hours

Max Marks: 100

Q.Code: V449

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- _____ is the study of how humans use, structure, and perceive time to communicate nonverbally.
- What is bypassing in business communication?
- The act of judging another culture solely by the values and standards of one's own culture is known as _____.
- Write the biasfree substitute of Manmade and Blind.
- Can we rely on him? (Turn into passive)
- Everyone in class need to study. (Correct the sentence)
- Identify the number of syllables in Pronunciation and technology.
- Write two words with long vowel sound in it.
- Discuss Agenda and Minutes as an important part of business meetings.
- How do analytical reports differ from informative reports?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Feedback is the final, essential component of the communication cycle that transforms one-way information transmission into a two-way dialogue. Justify the statement.
- Barriers to effective communication can result in confusion which can lead to incorrect information being conveyed or miscommunication which can lead to loss of business. Discuss some features of semantic and physical barrier with reference to this and suggest measures to overcome them.
- What is grapevine communication? Discuss four benefits of it in an organization.
- Discuss the significance of using bias-free language and its role in effective communication.
- Time and tense are related concepts, but they have different meanings. Elaborate your answer with suitable examples.

- f) Discuss the use of simple past tense and past perfect tense with suitable examples.
- g) There are specific words where a simple change in accent alters their classification. Discuss with examples.
- h) Discuss the sounds of English, classify them on the basis of vowels and consonants, voiced and voiceless, and oral and nasal sounds.
- i) As Sales Manager of a firm dealing with electrical goods write a suitable reply to a customer who has not clearly specified the details of the items he has ordered.
- j) As the Departmental Head write a memo to one of your employees informing him one day cut in salary for availing leave without prior information.
- k) How is a functional CV different from a Chronological CV?
- l) Imagine that you are selected for the personal interview round of campus interview. Write what would be your response to the following questions asked by the interviewers.
 - I. Tell us something about yourself.
 - II. What are your strengths and weaknesses?
 - III. Who has inspired you the most and why?
 - IV. Where do you see yourself after five years from now?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- | | | |
|-----------|---|-------------|
| Q3 | In today's business environment, why is effective cross-cultural communication crucial for fostering global understanding, diminishing stereotypes, and nurturing empathy in an interconnected world? | (16) |
| Q4 | A conditional sentence denotes a particular type of statement that expresses a cause-and-effect relationship, outlining a situation along with its potential result. Discuss English conditional sentences with appropriate examples. | (16) |
| Q5 | Discuss how the rising and falling pitch of the voice is vital in English for conveying meaning, emotion, and attitude beyond literal words. | (16) |
| Q6 | You wish to apply for a job as a response to the advertisement in a newspaper. Draft a cover letter along with your CV for this purpose. | (16) |

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)
Sub_Code: 23BS1004

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: Mathematics - II

BRANCH(S): AE, AEIE, AERO, AG, AI, AIML, AME, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CS, CSE, CSE(CS), CSEAI, CSEAIML, CSEDS, CSEIOT, CSIT, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, MMEAM, PLASTIC, PT

Time: 3 Hours

Max Marks: 100

Q.Code: V383

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is an exact differential equation? State the condition for exactness.
- Check whether the equation is exact or not:
 $(2xy + y^2)dx + (x^2 + 2xy)dy = 0$.
- Find the auxiliary equation of: $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = 0$.
- Define Euler-Cauchy equation and write its general form.
- Find the gradient of: $\phi(x, y, z) = 2x^2 + 6y^2 + 3z^2$.
- Find the curl of: $\vec{F} = x\hat{i} + 2y\hat{j} + z\hat{k}$.
- Check whether the function $f(z) = x^2 - y^2 + i(2xy)$ is analytic or not.
- Define harmonic function.
- Find: $\mathcal{L}\{1\}$.
- What is the Laplace Transform of a derivative?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Solve the exact differential equation:
 $(2xy + y^2)dx + (x^2 + 2xy)dy = 0$
- A body cools from 100 °C to 60 °C in 10 minutes in a room at 30 °C. Using Newton's Law of Cooling, find the temperature after 20 minutes.
- Solve using variation of parameters: $\frac{d^2y}{dx^2} + y = \sec x$
- Solve: $x^2y'' + 3xy' + y = 0$
- Verify Gauss Divergence Theorem for the vector field $\vec{F} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ over the cube bounded by $x = 0$ to 1, $y = 0$ to 1, $z = 0$ to 1.

- f) Evaluate the surface integral $\iint_S \vec{F} \cdot \hat{n} \, dS$ where $\vec{F} = x\hat{i} + y\hat{j} + z\hat{k}$ and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$.
- g) Find the harmonic conjugate of $u(x, y) = x^2 - y^2$ and hence form the analytic function.
- h) Evaluate using Residue Theorem: $\oint_C \frac{dz}{z^2+1}$ where C is $|z| = 2$
- i) Solve using Laplace Transform:
 $\frac{dy}{dt} + y = t, y(0) = 0$
- j) Evaluate:
 $\oint_C (x^2 - y^2) dx + 2xy dy$
 where C is the square with vertices $(0,0), (1,0), (1,1), (0,1)$.
- k) Solve: $\frac{d^2y}{dt^2} + 4y = \sin(2t), y(0) = 0, y'(0) = 1$
- l) Find inverse Laplace Transform of:
 $\frac{2s+1}{s^2+2s+5}$

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Solve the differential equation: $\frac{dy}{dx} + \frac{2y}{x} = x^2, x > 0$. and find the particular solution given $y(1) = 1$. Also discuss the behaviour of the solution as $x \rightarrow \infty$. (16)
- Q4 a)** Solve the differential equation using Laplace Transform: (8)
 $\frac{d^2y}{dt^2} + y = \sin t, y(0) = 0, y'(0) = 1$
- b)** Solve: $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{2x}$. (8)
- Q5 a)** Examine whether the function is analytic and find its derivative: (8)
 $f(z) = e^x(\cos y + i \sin y)$. Also express it in terms of z .
- b)** Expand $f(z) = \frac{1}{1-z}$ in Taylor series about $z = 0$ and state its region of convergence. (8)
- Q6 a)** Find the Laplace Transform of: $t^2 e^{3t}$. (8)
- b)** Using convolution theorem, find: $\mathcal{L}^{-1} \left\{ \frac{1}{s(s+2)} \right\}$ (8)

Registration No.:

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Total Number of Pages: 03

Course: B.Tech/IDD (B.Tech&M.Tech)

Sub_Code: 23BS1002

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: PHYSICS

BRANCH(S): AE, AEIE, AERO, AG, AIML, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CS, CSE, CSE(CS), CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MECH, METTA, MINERAL, MINING, MME

Time: 3 Hours

Max Marks: 100

Q.Code: V522

Answer Question No.1 (Part-I), which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- A body executes SHM with amplitude A. What happens to its total energy if the amplitude becomes double?
- In an RLC Circuit, inductance is 5 mH, the capacitance is 6 μ F, and the resistance is 200 Ω . Is the circuit under-damped, critically-damped, or over-damped?
- Define wavefront. How is it produced according to Huygens' principle?
- A monochromatic light of wavelength 650 nm is incident on a grating having 3000 lines/cm. Calculate the angle of diffraction for first-order spectrum.
- An electromagnetic wave has a magnetic field amplitude 2×10^{-7} T. Calculate the corresponding electric field amplitude in free space.
- What do you mean by displacement current? Why did Maxwell introduce it?
- What is a matter wave? Why are matter waves not observed for macroscopic bodies?
- An electron is moving under a potential of 150 V. Calculate the wavelength of the de-Broglie wave.
- Define metastable state in LASER physics.
- What is pumping in LASER systems? Why is it essential for achieving laser action?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- A forced oscillator is in resonance with the external periodic force ($F = F_0 \sin \omega t$). What is the amplitude of the oscillator and the phase difference between the driving force in the steady state?
- In Fraunhofer diffraction due to a single slit, write the conditions for principal maximum, secondary maxima, and minima. Show the distribution of intensity graphically in this diffraction pattern.

- c) In an LC circuit, the self-inductance is 2×10^{-2} H, and the capacitance is 8×10^{-6} F. At $t = 0$, all of the energy is stored in the capacitor, which has a charge of 1.2×10^{-5} C.
- What is the angular frequency of the oscillations in the circuit?
 - What is the maximum current flowing through the circuit?
 - How long does it take the capacitor to become completely discharged?
 - Find an equation that represents $q(t)$.
- d) Determine whether the given functions are waves or not
- $y(x, t) = \ln(x + vt)$
 - $y(x, t) = e^{-(ax - bt)^2}$
- e) Define the divergence of a vector field. Write its physical significance.
A vector field is given by $V(x, y, z) = ye^x \hat{i} - ze^y \hat{j} + \sin z \hat{k}$. Determine the divergence, curl, and check whether it is solenoidal, and/or irrotational.
- f) Show that the electromagnetic waves are transverse in nature.
- g) Show how Maxwell's wave equation in a vacuum leads to the conclusion that electromagnetic waves propagate at the speed of light. Derive the expression for the speed of light c in terms of ϵ_0 and μ_0 .
- h) Define phase velocity and group velocity. Find a relation between group velocity and phase velocity.
- i) Derive the time-dependent Schrödinger equation for a particle starting from the energy operator and wave function representation.
- j) What is the expectation value of the position of the particle for the wave function?
- $$\psi(x) = \sqrt{\frac{2}{L}} \sin \frac{\pi x}{L}, \quad 0 < x < L$$
- k) Specify three possible types of transitions between two atomic energy levels. Establish the relationship between Einstein's coefficients A_{21} , B_{21} , and B_{12} for a system in thermal equilibrium.
- l) With suitable diagrams, explain the construction and working of the He-Ne laser.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 a)** Set up the differential equation for a simple harmonic oscillator subjected to a damping force proportional to the velocity of the oscillator. Obtain its solution for under-damped motion. Graphically shows the variation of amplitude with time. (12)
- b)** The equation of a transverse wave traveling along a very long string is $y = 6 \sin(0.020\pi x + 4.0\pi t)$, where x and y are expressed in centimeters and t is in seconds. Determine (i) the amplitude, (ii) the wavelength, (iii) the frequency, (iv) the speed, (v) the direction of propagation of the wave, (vi) the maximum transverse speed of a particle in the string, and (vii) what is the transverse displacement at $x = 3.5$ cm when $t = 0.26$ s. (4)

- Q4 a)** Describe the formation of Newton's rings. Determine the wavelength of sodium light and the refractive index of a transparent liquid using Newton's rings experiment. (12)
- b)** Newton's rings are observed in light of a wavelength of $6000 \text{ \AA}$. The diameter of the 10th dark ring is 0.500 m . Find the radius of curvature of the planoconvex lens and the thickness of the air film. (4)
- Q5 a)** Write Maxwell's electromagnetic equations in integral and differential form. From Maxwell's equations in a conducting medium, obtain the electromagnetic wave equations for the electric and magnetic fields. (12)
- b)** A ruby laser has its metastable state at 1.79 eV , from which the stimulated emission produces laser light. Calculate the wavelength of the light. If 1 mole of Cr^{+3} ions is involved in the population inversion process in a pulse, calculate the pulse energy in eV . [Given $h = 4.14 \times 10^{-15} \text{ eV.s}$, $c = 3 \times 10^8 \text{ m/s}$] (4)
- Q6 a)** What do you mean by a particle in a box? Deduce the expression for energy and wave function for a particle in a box. (8)
- b)** What are acceptable conditions for a wave function ψ ? Let two functions ψ and Φ be defined for $0 \leq x < \infty$. Explain why $\psi(x) = x$ cannot be a wavefunction, but $\Phi(x) = e^{-x^2}$ could be a valid wavefunction. (8)

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub_Code: 23ES1003

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: Programming in C and Data Structure

BRANCH(S): AE, AEIE, AG, AIML, AME, AUTO, BIOTECH, CHEM, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MECH, METTA, MINERAL, MINING, MME

Time: 3 Hours

Max Marks: 100

Q.Code: V670

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Define identifier. Mention any two rules for naming identifiers.
- Write with example, the purpose of break statement.
- Write a program to swap two numbers without using third variable.
- Differentiate between library function and user-defined function.
- What is the purpose of return statement in a function?
- Write a program to find the length of a string without using strlen().
- Differentiate between malloc () and calloc().
- Differentiate between linear and non-linear data structures.
- What is the best-case complexity of binary search? Justify your answer.
- Write a function "**void insert (Struct BST *ptr, int x)**" to insert an element into BST.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Differentiate while loop, do-while loop and for loop with examples.
- Write a C program to check whether a number is palindrome or not.
- Explain operator precedence and associativity in C with examples.
- Explain with example what is recursion. Write its advantages and disadvantages.
- Write a C program to count vowels and consonants in a string.
- Write a C program to perform binary search on a sorted array.
- Explain call by value and call by reference with examples.
- Write a C program to find sum and average of array elements using pointers.
- Describe the empty and full conditions of a queue and a circular queue. Perform insertion and deletion operations in a circular queue.
- Write a C program for insertion operation in a singly linked list.

- k) Discuss bubble sort and calculate its time complexity in best, worst, and average case.
- l) Write a non-recursive C program for inorder traversal of binary tree.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Compare switch-case statement and nested if-else statement with suitable scenarios. (8)
b) Write a C program to generate all prime numbers from 1 to 1000. (8)
- Q4** a) Analyze the applications of one-dimensional and two-dimensional arrays and engineering problems. (8)
b) Write a C program to perform matrix multiplication using functions. (8)
- Q5** a) Compare static and dynamic memory allocation with respect to memory efficiency, execution speed with examples. (8)
b) Write a C program to reverse a string using pointers. (8)
- Q6** a) Analyze the advantages and limitations of linked list over arrays. (8)
b) Write a C program to convert infix expression to postfix expression. (8)

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)
Sub_Code: 23HS1001

2nd Semester Regular/Back Examination: 2025-26

SUBJECT: Universal Human Values

BRANCH(S): AE, AEIE, AERO, AG, AIML, AUTO, BIOTECH, CHEM, CIVIL, CS, CSE, CSEAI, CSEAIML, CSEDS, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC, IT, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: V451

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- Define ethics. How are values and ethics related?
- Describe the term 'Natural Acceptance'. How do you make out if it is your natural acceptance or not? Describe the characteristics of Natural Acceptance.
- Distinguish between 'animal consciousness' and 'human consciousness'.
- Define happiness as proposed in the chapter. Explain with two examples from your day-to-day life to support your answer.
- Define self-regulation and health? How are the two related?
- Distinguish between the feelings of care and guidance.
- Define the word "Excellence" as proposed in the text book. How can it be achieved through competition or mutual complementariness?
- Processes in nature are cyclic and mutually enriching. Explain this statement with a suitable sketch
- Reason out why it is essential to study about space.
- What do you understand by the term 'holistic technology' and 'holistic management system'?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- Define Skill. Elaborate on it with a few examples. Highlight the differences between Values and Skills. As mentioned in the first chapter, as a human being, we have two important questions to resolve: i. What to do? and ii. How to do? Elaborate on the meaning of these two questions with a few examples. How do you see the relationship between values and skills?
- What exactly are the following realities: i. "What I am", ii. "What is naturally acceptable to me", and iii. The dialogue between "what I am" and "what is naturally acceptable to me". Explain each with any three examples.
- What are the basic human aspirations and what are the requirements to fulfil them? Indicate their correct priority. Support your answer with three examples.
- Are excitement and happiness the same thing or different? Is there any difference between prosperity and accumulation of wealth? Explain with a few examples of both, preferably from your own experience. Critically examine the prevailing notions of happiness and prosperity in the society. What are the consequences of these notions?

- e) What is the qualitative difference between the activities of the Self and those of the Body? Illustrate with a few examples. The domain of consciousness is fulfilled by the activities of consciousness, while the domain of material is fulfilled by material things. Consciousness cannot be fulfilled by material. Explain these statements with suitable examples.
- f) Why is it important to study the Self? How does it help in your day-to-day life? Explain the activities of the Self with a diagram. With the help of suitable examples, show how are they related.
- g) Feelings in the Self are fundamental to live with fulfilment in relationship. Evaluate this statement. What are the feelings (values) in human relationship? Are they naturally acceptable to you? Do you think these feelings are also naturally acceptable to others? What is the outcome when we try to identify relationship based on the exchange of physical facility alone?
- h) How is trust the foundation value of relationship? Illustrate the feeling of trust with one example, preferably from your own experience. 'If I trust the intention of everyone, people would take undue advantage of me'. Is this statement true or false? Explain.
- i) Give one example each of over evaluation, under evaluation and otherwise evaluation. Why are these evaluations leading to disrespect? What problems do we face because of these wrong evaluations?
- j) What is justice? Is it a continuous or a temporary need? What is the basis of an undivided society – the world family?
- k) Explain, giving examples, how pollution and resource depletion are both the direct outcomes of not understanding nature the way it is. Indicate a few steps to promote harmony in the society and co-existence with nature.
- l) "Values effect both the structure as well as the utilisation of technologies". Do you agree? Give justification for your response.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Evaluate the role of education in achieving holistic development in human life. In your answer, address the following aspects: a) Explain the concept of holistic development and its significance in human life. b) Analyse the characteristics and limitations of the present education system in promoting holistic development. c) Assess whether the current education system effectively contributes to the overall development of individuals. d) Suggest the role of Universal Human Values education in achieving holistic development in technical and professional education. (16)
- Q4** Assess the importance of harmony in the human being for achieving happiness and a balanced life. In your answer: a) Explain the concept of the human being as the co-existence of the self and the body. b) Analyse the differences between the needs of the self and the needs of the body. c) Evaluate the importance of harmony between the self and the body in maintaining happiness and health. d) Suggest practical approaches to ensure self-regulation and harmony in daily life. (16)
- Q5** Discuss the role of relationships and human values in establishing harmony in family and society. In your answer: a) Explain the basis of harmony in family relationships. b) Analyse the role of trust and respect as foundational values in relationships. c) Evaluate how justice and other feelings contribute towards mutual happiness in society. d) Suggest measures to strengthen harmony and responsibility in family and social life. (16)
- Q6** Evaluate the relationship between harmony in nature and professional ethics in developing a sustainable society. In your answer: a) Explain the interconnectedness and mutual fulfilment among the four orders of nature. b) Analyse the impact of human activities on ecological balance and sustainability. c) Evaluate the importance of professional ethics in ensuring responsible and sustainable technological and industrial development. d) Propose suitable measures for promoting value-based and environmentally responsible professional practices. (16)