

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: 23ES1006

1st / 3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Basic Mechanical Engineering

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

Time: 3 Hours

Max Marks: 100

Q.Code: U689

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)

- State the Zeroth Law of Thermodynamics and its importance.
- Define entropy. State its unit.
- State the significance of the critical point of a substance.
- Distinguish between SI and CI engines.
- Define specific gravity of a fluid.
- Estimate the difference in pressure between 10 m of mercury column and 10 m of water column in Pascals.
- What are the criteria for selection of manometric fluid.
- What is hardness? Name the hardest and softest material in engineering.
- State two advantages of belt drives.
- What is meant by degree of freedom (DOF) of a robot?

Part-II

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

- Explain the terms: process, path, state, and cycle in relation to thermodynamics with illustrative diagrams.
- Discuss the limitations of the First Law of Thermodynamics. How are they addressed?
- State and explain the Second Law of Thermodynamics with Kelvin–Planck and Clausius statements.
- Explain the modes of heat transfer with suitable examples.
- A hydraulic press has a ram of 15 cm in diameter and a plunger of 1.5 cm in diameter. What force would be required on the plunger to raise a weight of 25 kN on the ram?
- Define viscosity. Discuss the causes of viscosity of a fluid. How does viscosity of a fluid vary with temperature?

- g) Define vapor pressure of a liquid. How is it related to boiling? Highlight the parameters affecting vapor pressure of a liquid.
- h) Discuss common casting defects, their causes, and remedies.
- i) Explain the principle and working of arc welding with a neat sketch.
- j) Compare hot working and cold working processes.
- k) Explain the construction and working of gear drives.
- l) Describe different types of clutches used in automobiles.

Part-III

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

- Q3** a) During process A, system receives 20 kJ heat and produces 30 kJ work. The process B between same end conditions, receives of 15 kJ heat. Determine the change in internal energy during the process and work done in process. Prove that if the cycle is formed using processes A and B, the given data confirms to the first law of thermodynamics. **(8 + 8)**
- b) Air at 12 °C and 85 kPa enters the diffuser of jet engine steadily with a velocity of 220 m/s. The inlet area of the diffuser is 0.38 m². The air leaves the diffuser at a negligible velocity compared to inlet velocity. Calculate (i) mass flow rate of air (ii) the temperature of air leaving the diffuser.
- Q4** a) A shaft of 6 cm in diameter and 60 cm long is pulled steadily a $V = 0.6$ m/s through a sleeve 6.02 cm in diameter. The clearance is filled with oil having kinematic viscosity of 0.006 m²/s and specific gravity, $S = 0.88$. Estimate the force required to pull the shaft. **(8 + 8)**
- b) An inverted U-tube manometer is connected to two pipes, A and B, transporting water (density, $\rho_w = 1000$ kg/m³). The top of the manometer is filled with oil (specific gravity, $S = 0.8$). The center of pipe A is 30 cm higher than B. The oil-water interface in the left limb (connected to A) is 20 cm below the center of A. The oil-water interface in the right limb is 40 cm below the center of B. Find the pressure difference $P_A - P_B$.
- Q5** a) Compare casting, welding, and forming processes. **(8 + 8)**
- b) Discuss the role of material properties in manufacturing process selection.
- Q6** a) Describe different types of brakes and their applications. **(8 + 8)**
- b) Describe the anatomy of a robot with the help of a block diagram.

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Total Number of Pages: 02

B.Tech
RME3C001

3rd Semester Back Examination: 2025-26

SUBJECT: Mechanics of Solid

BRANCH(S): AME, AUTO, CIVIL, MECH

Time: 3 Hours

Max Marks: 100

Q.Code: U623

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 the difference between normal stress and shear stress?
- What is thermal stress?
- Differentiate between Thin and Thick cylinder.
- What is the value of maximum bending moment for a simply supported beam of length 'L' and carrying a point load 'W' at mid span.
- What do you understand by point of inflection?
- Define slope and deflection for a Cantilever beam at its free end.
- What do you understand by effective length of a column?
- Define Shaft. What is the type of loads subjected by shaft?
- Write the equation for strain energy stored in a shaft due to torsion.
- What is a spring? Where is it used?

Part-II

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

(6 x 8)

- Draw the stress –strain diagram of mild steel and explain each part of the graph.
- What are the different Elastic constants? Explain briefly.
- Draw the Mohr's Circle for a member under pure shear stress and give one example for it.
- Explain the followings:
 - Different types of Support
 - Different types of Beams
 - Different types of Loading
- What are the assumptions used for Theory of simple bending? Discuss.
- Draw the sketch showing the bending stress and shear stress distribution of a simply supported beam of rectangular cross section and subjected to a uniformly distributed load.
- Write short note on slope and deflection of beams by area - moment method.
- Discuss about different end conditions for column and their respective equivalent length.
- Find out the principal stresses and the maximum shear stress for the shaft of diameter 80 mm under combined maximum torque of 955 kN.mm and Maximum bending moment of 800 kN.mm.

- j) What is the difference between shear stress in bending and shear stress in torsion? Show the shear stress distribution for circular cross section.
- k) A closed coil helical spring has a maximum load of 50 N and maximum shear stress induced is 100 MPa. The spring constant is 60 N/m in compression. If the solid length (coils touching) of the spring is 60 mm, determine the wire diameter and the coil diameter. Take $G = 32 \text{ GPa}$.
- l) Differentiate between Izod and Charpy impact tests. Explain how impact strength of a material is determined.

Part-III

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

- Q3** A steel bar of 25 mm diameter is acted upon by forces as shown in Fig 1. What is the total elongation of the bar. Take $E = 190 \text{ GPa}$. **(16)**

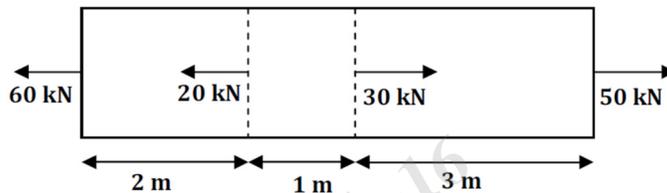


Fig. 1

- Q4** Draw the Shear force diagram and Bending moment diagram for simply supported beam as shown in the Fig. 2. **(16)**

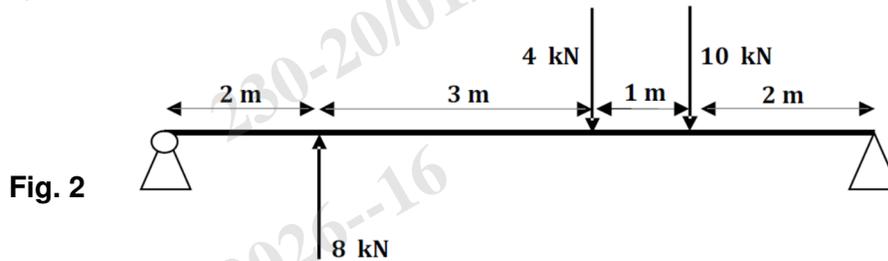


Fig. 2

- Q5** Draw Mohr's circle for following state of stress as shown in Fig. 3. **(16)**

- a) Find out the value of stresses on Principal Planes and its position from the Vertical plane.
- b) Find out the stresses on plane making 30° angle from the vertical plane.

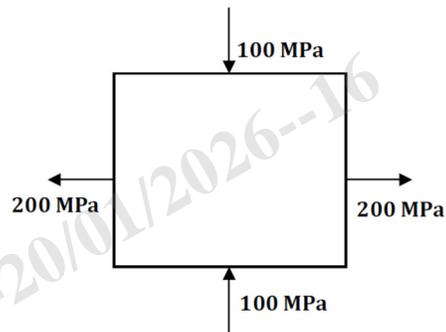


Fig. 3

- Q6** Describe the tensile testing procedure using UTM and explain how mechanical properties such as yield strength, ultimate tensile strength, Young's modulus, and percentage elongation are determined from the stress-strain curve. **(16)**

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Course: B.Tech/IDD
Sub_Code: EOPC2002

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Analog and Digital Electronic Circuits

BRANCH(S): EE, BIOMED, EEE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C. E

Time: 3 Hours

Max Marks: 100

Q.Code: U558

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

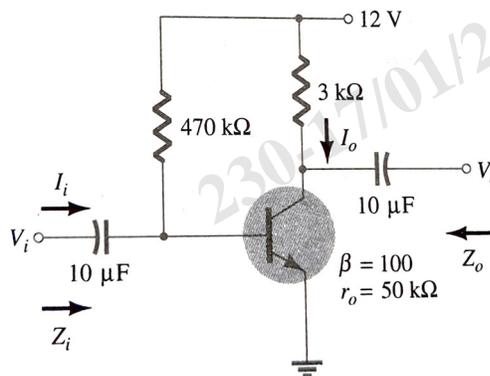
Q1 Answer the following questions: (2 x 10)

- What is load line? Why this is straight line?
- What is a model? Obtain the r_e model of all the three configurations of BJT.
- Draw and explain the fixed bias configuration using a P-channel depletion type MOSFET.
- Draw the equivalent model of JFET voltage divider configuration and find its Z_i and Z_o .
- Explain the Wien-Bridge oscillator circuit.
- How class B amplifier is different from class A amplifier?
- Simplify the Boolean expression $Y = \sum m(2, 4, 6)$.
- Derive the K-maps and simplified expressions for outputs of a half adder.
- Differentiate between a combinational circuit and a sequential circuit.
- How registers are designed? How can you classify registers? Explain.

Part-II

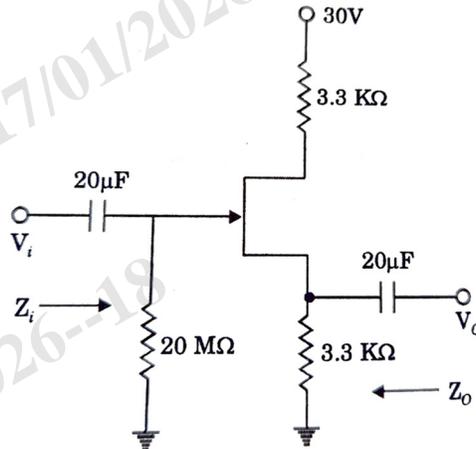
Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Explain the operation of voltage divider biasing using BJT. Why is it widely used?
- For the network of figure given below,
 - Find Z_i , Z_o , A_v , and A_i with $r_e = \infty$.
 - Repeat (I) with $r_e = 50 \Omega$.

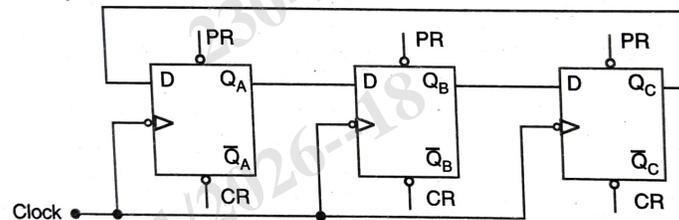


- For a voltage feedback biasing circuit with $\beta = 45$, $V_{CC} = 24 \text{ V}$, $V_{CE} = 5 \text{ V}$, $R_C = 10 \text{ k}\Omega$, and $R_E = 270 \Omega$, find the value of feedback resistance R .
- Explain the self-bias configuration of FET biasing. Discuss about its stability.

- e) Draw the small signal equivalent model of a common source amplifier circuit using N-Channel D-MOSFET and find its necessary parameters Z_i , Z_o , A_v , and A_i
- f) Determine the value of Z_i , Z_o , A_v , and A_i for the given circuit with $I_{DSS} = 6 \text{ mA}$, $V_P = 6 \text{ V}$, and $R_d = 40 \text{ K}\Omega$



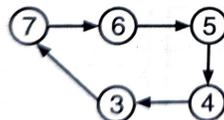
- g) Write the Bark-Hausen's criteria for oscillation. Explain the working principle of an oscillator.
- h) Explain the RC-Phase shift oscillator and find the expression for the frequency of oscillation.
- i) Use the Quine-McCluskey method of minimization and find the expression for $f(A, B, C, D) = \sum m(2, 4, 8, 11, 15) + d(1, 10, 12, 13)$
- j) Implement a full adder using 8:1 multiplexer.
- k) Explain the working operation of a D-flip flop.
- l) Consider the given circuit shown below. Here the initial output condition is $Q_A Q_B Q_C = 010$. Write the truth table of output $Q_A Q_B Q_C$ for 4 clock pulses.



Part-III

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

- Q3 Discuss all about the compound configurations of cascade, cascode, Darlington, and current mirror circuits (16)
- Q4 Find the parameters Z_i , Z_o , A_v , and A_i of Common gate and source follower amplifiers. (16)
- Q5 What is a power amplifier? How is it classified? Explain the operation of push-pull amplifier circuit. Find the efficiency of class-B amplifier and compare it with that of class-A amplifier (16)
- Q6 Write a note on one bit magnitude comparator. Design a ripple counter for the state diagram shown in figure below. (16)



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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RBL1B002

1st Semester Back Examination: 2025-26

SUBJECT: BASIC ELECTRONICS ENGINEERING

BRANCH(S): CIVIL, CSE, CSEAIML, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC,
MECH, MINING

Time: 3 Hours

Max Marks: 100

Q.Code: U729

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 intrinsic and extrinsic semiconductor.
- Find the static resistance of a Si diode, if 60 mA current flowing for a forward bias of 0.9 V at 300 K?
- Find the relation between ' α ' and ' β ' of a transistor.
- Define source, drain, and gate terminal of a JFET.
- Draw the circuit symbol for n-channel D-MOSFET and n-channel E-MOSFET.
- What do you understand by CMOS technology?
- Mention few applications of OP-AMP.
- Multiply the binary numbers 10111 and 101.
- Explain the terms: bit, nibble, and byte.
- Draw the logic symbol of X-OR. Mention its truth table.

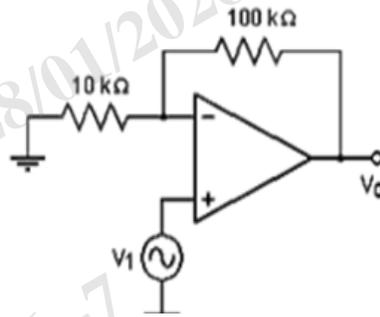
Part-II

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

(6 x 8)

- What is breakdown diode? Write notes on Zener breakdown.
- Draw output characteristics for CB and CE configuration using n-p-n transistor. Mention current expression for both the cases.
- Find the diode current of a Ge diode having reverse saturation current of 1.5 μ A at 300 K for an applied forward bias of 0.3 V.
- What do you understand by n-channel and p-channel JFET? Draw the drain and transfer characteristic of n-channel JFET indicating all parameters clearly.
- Draw the circuit symbols and mention some difference between JFETs and MOSFETs.
- With suitable diagrams discuss the operation of a p-n junction diode.
- Subtract $(15)_{10}$ from $(8)_{10}$ using 2's complement method of subtraction.
- With suitable diagram explain how Op-Amp can be used as an integrator.

- i) The following circuit is in which configuration? Find the output voltage and gain of the circuit for $V_1 = 10 \text{ mV}$.



- j) Convert the $(100)_{10}$ in to
 (I) Binary (II) Octal (III) Hexadecimal
- k) Implement the Boolean expression $Y = ABC + A\bar{B}\bar{C} + \bar{A}B\bar{C}$ in a logic diagram. Construct the truth table and find the output for $A = 1, B = 0, C = 1$.
- l) Simplify the following Boolean expressions.
 (i) $Y(A, B, C) = (A + B + \bar{C})(A + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})(\bar{A} + \bar{B} + \bar{C})$
 (ii) $Y(A, B, D) = (A + B + D)(\bar{A} + B)\bar{D}$

Part-III

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

- Q3** With a neat circuit diagram explain the working of full-wave bridge rectifier. Mention its advantages and disadvantages in comparison to center-tapped rectifier. **(16)**
- Q4** With a neat sketch, explain the construction and principle of operation of n-channel JFET. **(16)**
- Q5** With suitable diagram, describe the use of an OP-AMP as an adder. **(16)**
- Q6** Design AND and X-OR using
 (i) NAND only (ii) NOR only **(8 x 2)**

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Course: B.Tech
Sub_Code: RCS3C001

3rd Semester Back Examination: 2025-26
SUBJECT: Digital Logic Design
BRANCH(S): CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST
Time: 3 Hours
Max Marks: 100
Q.Code: U614

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)

- Write truth tables of D and JK Flipflops.
- Design and draw logic diagram of 4-bit Ripple Carry Adder.
- What is Read only Memory? How PROM, EPROM, and EEPROM differ from each other?
- What is Master Slave JK Flipflop? Explain the disadvantages of JK Flipflop.
- Using K Map simplify the given expression $F(A, B, C, D) = \sum m(0, 4, 5, 6, 7) + \sum d(2, 8, 11, 15)$
- What is cache memory? Why is it called high speed memory?
- Write the Boolean expression for a 2 to 4 size decoder.
- Perform the subtraction $(15)_{10} - (60)_{10}$ using 2's complement method.
- Draw a T-flip flop and write its excitation table
- What is the decimal equivalent of the hexadecimal number "BAED"?

Part-II

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

- What is race around condition? Construct master slave flipflops using SR flipflop.
- Design a 1-bit Full adder using only 3 to 8 size decoder and basic gates.
- Design a circuit for the function $Y = AB(C + D)$ using only 8:1 multiplexer.
- Explain how a JK flipflop can be converted into a D flipflop.
- Design a MOD-12 asynchronous counter using JK-flipflops.
- Design a MOD-10 synchronous counter using D flipflops.
- Design a 2:1 Multiplexer circuit using programmable logic array.
- Write VHDL or Verilog code for designing a 3:8 size decoder.
- Write VHDL or Verilog code for designing 8:1 multiplexer.
- Explain the operation of bidirectional shift register.
- Draw and describe the architecture of Field Programmable Gate Array.
- Design a 3-bit binary to gray code converter using logic gates.

Part-III

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

Q3 Design a combinational circuit that gives an output 'two' more than the input numbers when the inputs are (1, 7, 11, 13) and 'four' less than the input numbers when inputs are (6, 12, 17, 19). (16)

Q4 (16)

Present State	Next State		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
<i>a</i>	<i>a</i>	<i>b</i>	0	0
<i>b</i>	<i>c</i>	<i>d</i>	0	0
<i>c</i>	<i>a</i>	<i>d</i>	0	0
<i>d</i>	<i>e</i>	<i>d</i>	0	1
<i>e</i>	<i>a</i>	<i>d</i>	0	1

Derive the state diagram for the above state table after the binary assignment of each state. Design the corresponding sequential circuit.

Q5 Design the Boolean function $Y = A(B + C) + D$ using only 4:1 multiplexer. (16)

Q6 What is Johnson counter? Explain it with shift register. (16)

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RMA3A001

3rd Semester Back Examination: 2025-26

SUBJECT: MATHEMATICS - III

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

Time: 3 Hours

Max Marks: 100

Q.Code: U496

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)

- Write the iterative formula for the Newton-Raphson method to find a root of $f(x) = 0$.
- Discuss the difference between Doolittle method and Crout method?
- What is the geometrical interpretation of the Trapezoidal Rule?
- Using modified Euler method, find $y(0.6)$ if $h = 0.3$ and $y' = x^2 + y^2, y(0) = 1$
- Define conditional probability with a suitable example.
- State the Baye's theorem.
- If X follows a Binomial Distribution $B(n, p)$, write the expressions for its Mean and Variance.
- Write 2 properties of correlation coefficients.
- Define the probability density function of a Normal Distribution with mean μ and variance σ^2 .
- Differentiate between a Null Hypothesis (H_0) and an Alternative Hypothesis (H_1).

Part-II

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

(6 x 8)

- How many iterations is required to approximation a root $f(x) = 0$ in $[a, b]$, for which error less than 10^{-5} in bisection method?
- Using Newton's divided difference interpolation, find $y(10)$ given that $y(5) = 12, y(6) = 13, y(9) = 14, y(11) = 16$.
- Solve the system of equations using Crout's Method (LU Decomposition): $x + y + z = 1, 3x + y - 3z = 5, x - 2y - 5z = 10$.
- Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using Simpson's $\frac{3}{8}$ Rule.
- Using the Runge-Kutta method of order two, find $y(0.6)$ if $h = 0.1$ for $y' = x^2 + y^2, y(0) = 1$.
- Evaluate $\int_0^1 (1 + \frac{\sin x}{x}) dx$ correct to 3 decimal places using trapezoidal rule.

g) A bag contains 4 white and 6 black balls. Two balls are drawn at random without replacement. Find the probability that both balls are black.

h) A random variable X has the following probability distribution:

X	0	1	2	3	4
$P(X)$	k	$3k$	$5k$	$7k$	$9k$

Then find the value of k and calculate $P(X \geq 2)$.

i) If 3% of the electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs, exactly 4 bulbs are defectives. (Use Poisson Distribution)

j) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

k) Calculate the Coefficient of Correlation between X and Y from the following data:

X	1	2	3	4	5
Y	2	5	11	8	14

l) Find the Maximum Likelihood Estimator (MLE) for the parameters Binomial distribution.

Part-III

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

Q3 a) Solve the system of linear equations $10x + 2y + z = 9$, $2x + 20y - 2z = -44$, $-2x + 3y + 10z = 22$ using the Gauss-Seidel Method. Perform 3 iterations starting with initial guess $(0,0,0)$. (8 x 2)

b) Using Newton-Raphson method find the smallest positive real root of the equation $x^4 - 3x^2 + x - 10 = 0$.

Q4 a) Apply Euler's Modified Method to find the value of $y(0.2)$ given $\frac{dy}{dx} = x + \sqrt{y}$, $y(0) = 1$, taking step size $h = 0.1$. (8 x 2)

b) Evaluate the integral $\int_0^1 e^{-x^2}$ by using Gauss-Legendre 2-point integration formula.

Q5 a) The joint probability density function of two random variables X and Y is given by $f(x, y) = c(xy + e^x)$ for $0 < x < 1$, $0 < y < 1$ and 0 otherwise. Find the value of c and the marginal density functions of X and Y . (8 x 2)

b) State and prove Chebyshev's Inequality for a random variable X with mean μ and variance σ^2 .

Q6 a) Compute and interpret the correlation coefficient for the following data of 6 students selected at random: (8 x 2)

Mathematics grade	70	92	80	74	65	83
English grade	74	84	63	87	78	90

b) Obtain the lines of regression for the following data and estimate Y when $X = 10$

X	1	2	3	4	5
Y	3	4	5	7	11

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Course: B.Tech
Sub_Code: PCAC2002

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Data Science Foundations

BRANCH(S): AEIE, BIOMED, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, ECE, EEE, ELECTRICAL,
ETC, MECH, METTA, MINING, PT

Time: 3 Hours

Max Marks: 100

Q.Code: U715

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)

- What is a CSV file? How is it read in Python?
- List any four features of the NumPy library.
- What is the difference between a Python list and a NumPy array?
- What is data cleaning? Why is it required in data analysis?
- What is Hadoop?
- What is a pivot table in Pandas?
- Define Big Data.
- What is scalability in Big Data systems?
- What is HDFS?
- What is YARN?

Part-II

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

- Explain the use of merge () function in Pandas with an example.
- Discuss how groupby() helps in data aggregation and analysis.
- Explain different techniques for handling missing and duplicate data.
- Describe the importance of data preprocessing in data science.
- Explain Volume, Velocity, and Variety with examples.
- Explain why scalability is a critical requirement in Big Data analytics.
- Explain the architectural components of Big Data systems.
- Explain the Hadoop architecture with a neat diagram.
- Explain the MapReduce programming model.
- Describe DataFrame operations such as selection, filtering, and indexing.
- Discuss the role of Big Data in Data Science.
- Describe the lifecycle of a Big Data analytics project.

Part-III

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

- Q3** Explain how messy data can be cleaned and transformed using Pandas for meaningful analysis. (16)
- Q4** Explain how 2D and 3D visualizations help in better understanding and interpretation of Big Data. (16)
- Q5** Discuss the impact of outliers on data analysis and how they can be handled. (16)
- Q6** Explain the 5-step process used to extract value from Big Data with a suitable example. (16)

Registration No.:

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Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)
Sub_Code:CSPC2002

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Data Structures

BRANCH(S): CSE,CSEDS,CSEIOT,CSIT,CST,ELECTRICAL&C.E., IT

Time: 3 Hours

Max Marks: 100

Q.Code: U673

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)

- Mention the advantages of representing stacks using linked lists than arrays.
- State the difference between queues and linked lists.
- Emphasize on why we need data structures.
- List the various operations that can be performed on data structures.
- State the advantages of doubly linked lists over single linked lists.
- Write the prefix and postfix notations of the given expression:
 $A + B * (C - D) / (P - R)$
- Define the following terms: Height of a tree, Depth of a tree
- List out few of the applications of tree data structure.
- Which sorting algorithm is best if the list is already sorted? Why?
- What do you mean by divide-and-conquer strategy?

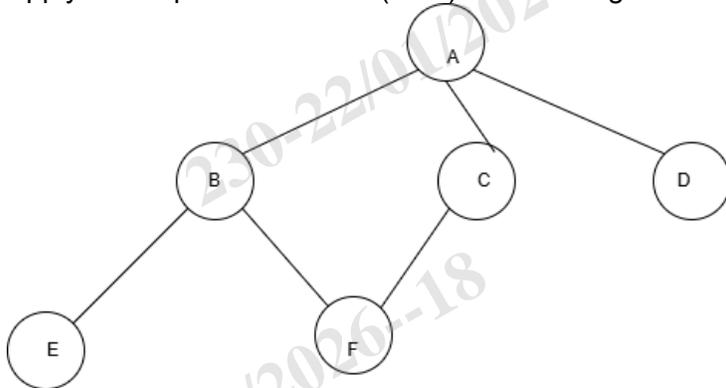
Part-II

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

- Write the pseudo-code for inserting an element to the end of an array.
- Write the pseudo-code for implementing linear search? Analyze the time complexity of both algorithms.
- Write the function for inserting an element into a queue using an array.
- Write the pseudocode for inserting an element at the middle of a doubly linked-list.
- Write the pseudocode for inserting and deleting an element from an priority queue.
- Construct a binary search tree given the pre-order and post-order traversals:
Pre-order: 100,20,10,30,200,150,300
Post-order: 10,30,20,150,300,200,100
- Perform merge sort on the following sequence of elements:
38,27,43,3,9,82,10
Also, write the pseudocode for implementing the Merge Sort.
- Show the step-wise tree structure for performing the Heap-sort on the following sequence of elements:
73,6,57,88,60,42,83,72,48,85

- i) Find the value of EXP(4,8) using recursion, given:

$$\text{EXP}(x,y) = \begin{cases} 1, & \text{if } y == 0 \\ X * \text{EXP}(x, y-1) \end{cases}$$
- j) Apply quadratic hashing to fill the hash table of size 11 elements:
 20, 5, 10, 22, 33, 40, 50, 30
- k) Apply the Depth First Search(DFS) traversal algorithm on the following graph:

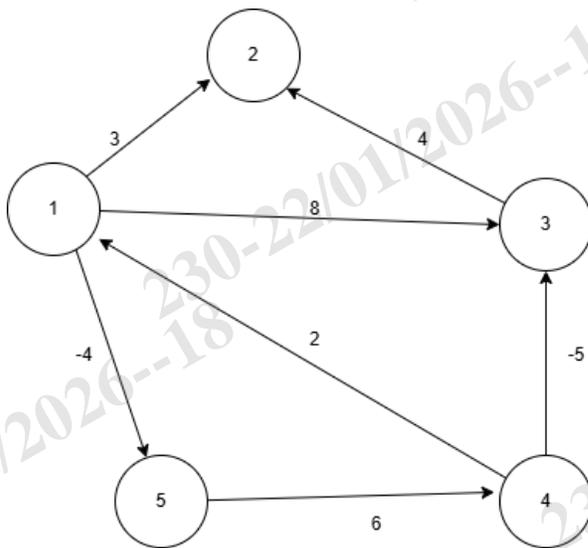


- l) Write the pseudocode for inserting an element and deleting an element from the stack. Explain with an example.

Part-III

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

- Q3** Write a C program for displaying an array in reverse order. **(16)**
- Q4** Write a C program to insert and display the elements in a circular linked list. **(16)**
- Q5** Apply the Floyd-Warshall's algorithm for constructing the shortest path from the following graph: **(16)**



- Q6** Create an AVL Tree with the following sequence of numbers:
 3, 14, 7, 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4
 Show each step **(16)**

Registration No:

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Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)/B.Tech
Sub_Code: EOPC2004

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Digital Electronics

BRANCH(S): AI, CSE, CSEAI, CSEAIML, CSEDS, CSEIOT, CSIT, CST, IT

Time: 3 Hour

Max Marks: 100

Q.Code : U613

Answer Question No.1 (Part-1) 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 are minterms and maxterms?
- Find the minimum number of 2-input NAND gates required to implement a 2-input XOR gate.
- How many OR gate and half adder are required to implement a full adder Circuit?
- What is essential prime implicant?
- Perform the following binary arithmetic: (i) $1011 + 0110$, (ii) $11100 - 1011$
- Define error-detecting code with an example.
- Define functional completeness of logic gates.
- A 4 bit modulo-16 ripple counter uses JK flipflops. If the propagation delay of each Flip-flop is 50 ns. Then find the maximum clock frequency.
- Find the minimum number of flip-flops required for a Mod-9 (BCD) counter.
- Define Algorithmic State Machine (ASM).

Part-II

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

- Explain SR and JK flip-flops with characteristic tables.
- Implement the Boolean function $F(A, B, C, D) = \Sigma(1, 3, 5, 7, 8, 12, 14)$ using a 4-to-1 multiplexer
- Describe the Quine–McCluskey minimization technique.
- Explain the working of a serial binary adder.
- Simplify the Boolean expression $F(A, B, C) = A' B' C + A'BC + ABC$ using a Karnaugh map.
- Design a 1-bit magnitude comparator using logic gates and extend the concept to a 2-bit comparator.
- Describe the synthesis of synchronous sequential circuits with an example.
- Explain flip-flop and design a modulo-N ring counter.
- Differentiate between decoder and demultiplexer. Under what circumstance a decoder can be converted into demultiplexer?

- j) If $(1235)_x = (3033)_y$, where x and y indicate the bases of the corresponding numbers, then find the value of x and y .
- k) Explain the difference between static and dynamic hazards and describe design techniques to eliminate them
- l) A finite state machine is designed using d flip flops. Explain how state assignment impacts power consumption and switching activity in the circuit.

Part-III

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

- Q3** a) Design of 16×1 MUX using 4×1 MUX. **(8+8)**
b) Convert the SR Flipflop to JK Flipflop.
- Q4** a) Design a parity bit generator for a 4-bit data word using logic gates. **(6+10)**
b) Implement a 3-to-8 line decoder using AND and NOT gates. Draw the gate-level realization.
- Q5** a) Design a 4-bit sequential adder using shift registers and flip-flops. Explain the gate-level operation. **(8+8)**
b) Design a modulo-6 synchronous counter using T flip-flops. Derive excitation equations and draw the complete gate-level circuit.
- Q6** Explain Algorithmic State Machines and discuss system design using ASM for **(8+8)**
c) Weighing machine.
d) Binary multiplier.

Registration No.:

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Total Number of Pages: 03

B.Tech/IDD
EEPC2001

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Electrical Circuit Analysis

BRANCH(S): EE, AEIE, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ETC

Time: 3 Hours

Max Marks: 100

Q.Code: U615

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)

a) Find the complete incidence matrix of the given graph. (Fig. 1)

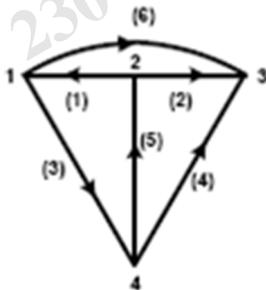


Fig. 1

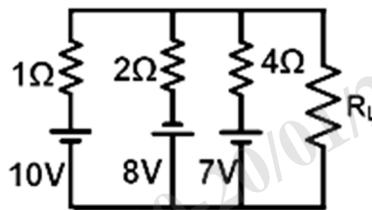


Fig. 2

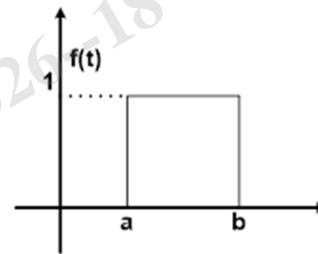


Fig. 3

- b) Apply Millman's theorem to find the current in the load resistor ($R_L = 5\Omega$) in the circuit shown in Fig. 2.
- c) State the initial and final value theorem. Briefly explain its significance with examples.
- d) Find the Laplace Transform of the rectangular pulse as shown in Fig. 3.
- e) State the number of poles and zeroes, and obtain the locations in real-imaginary plane.

$$F(s) = \frac{25(10s + 4)(s + 6)}{s(s^2 + 1)}$$

- f) Is the polynomial $Q(s) = s^3 + 6s^2 + 11s + 6$ Hurwitz? Check.
- g) Explain the term "Coefficient of Coupling" and its significance for coupled circuits.
- h) Draw the characteristics of 1st order LP, HP, BP, and BS filters versus its respective ideal filter counterparts.

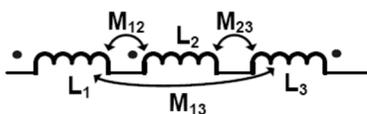


Fig. 4

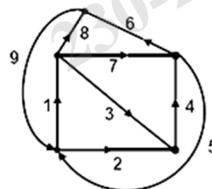


Fig. 5

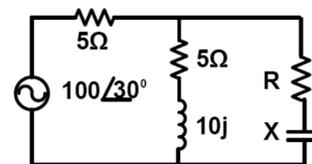


Fig. 6

- i) Find the equivalent inductance in Fig. 4.
- j) Write the h-parameter equations of a two-port network. Define h_{11} , h_{12} , h_{21} , and h_{22} .

Part-II

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

- a) The linear oriented graph is given as in Fig. 5. Considering a tree, mark all the fundamental cut sets and form the cutset matrix.
- b) Determine for the network shown in Fig. 6, (i) the values of R and X that will result in maximum power being transferred across terminals AB, and (ii) the value of the maximum power.
- c) Verify Reciprocity Theorem for the network shown in Fig. 7.
- d) Explain the concept of duality and dual networks.
- e) A resistance of 4 Ω and an inductance of 0.1 H are connected in series and excited by a voltage $v = 100\sin 40t$. Find an expression for the current. The initial current in the circuit is zero.

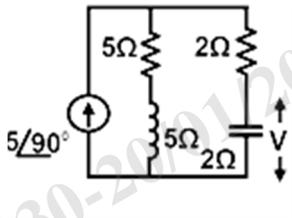


Fig. 7

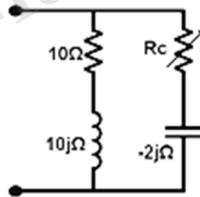


Fig. 8

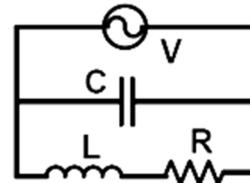


Fig. 9

- f) Calculate the value of R_c in the given circuit to yield resonance in Fig. 8.
- g) Find the frequency of resonance for the parallel resonance circuit in Fig. 9.

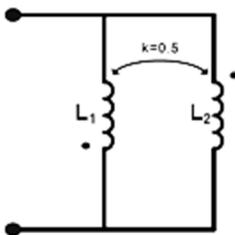


Fig. 10

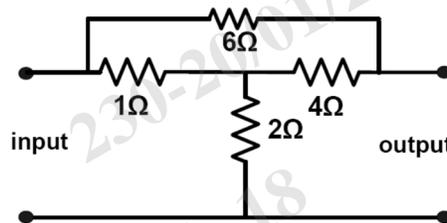


Fig. 11

- h) In the circuit of Fig. 10, find the equivalent inductance.
- i) State and explain the standard test functions (impulse, step, and ramp functions). Also establish the relations among its Laplace transforms.
- j) What are the necessary and sufficient conditions for a rational function $F(s) = P(s)/Q(s)$ to be positive real. State at least 3 properties of a PRF.
- k) Find the z and h parameters of the two-port network in Fig. 11.
- l) Using Cauer-I form, synthesize the function

$$F(s) = \frac{(s^2 + 1)(s^2 + 16)}{s(s^2 + 4)}$$

Part-III

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

- Q3 a)** Determine the Z and ABCD parameters of given network as shown in Fig. 16. **(10)**
- b)** For the given network shown in Fig. 17, find the transfer functions $G_{21}(s)$, and driving point impedance $Z_{11}(s)$. **(6)**

- Q4 a)** Write the loop equations in matrix form for the given network in Fig. 13 with source 10 V. **(6)**

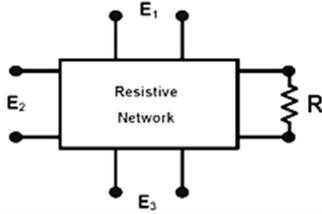


Fig. 12



Fig. 13

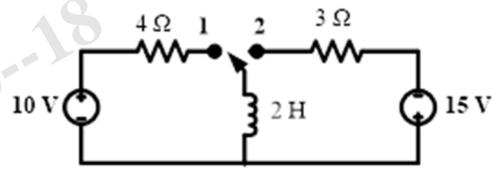


Fig. 14

- b)** In the network shown (Fig. 12), the power dissipated in 'R' when E_1 , E_2 , or E_3 acting alone is (i) 20W, 80W, and 5W respectively (ii) 30W, 270W, and 120W respectively. Calculate the maximum power that can dissipate due to the simultaneous action of all the sources. Calculate for both (i) and (ii), what will be the minimum power dissipated in 'R' when all the sources are acting simultaneously? **(10)**
- Q5 a)** In the circuit shown above (Fig. 14), initially the switch is at position-1. Then it is moved to position-2 at $t = 0$ sec. Obtain the expression of the current in the circuit for $t > 0+$. Solve the above by t-domain analysis & Laplace transform method. Compare the two methods. **(10)**
- b)** Assuming zero initial conditions, find $i(t)$ in the circuit given in Fig. 15. **(6)**
- Q6 a)** Synthesize the Foster-I and II form of the following LC driving point impedance. **(12)**
- $$Z(s) = \frac{(s^2 + 1)(s^2 + 8)}{s(s^2 + 4)}$$
- b)** State various properties of a driving point immittance function. Explain with example. **(4)**

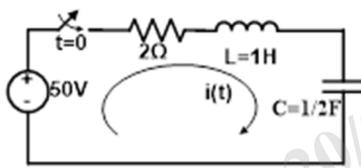


Fig. 15

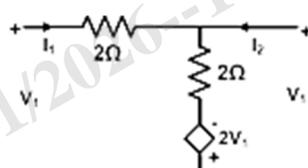


Fig. 16

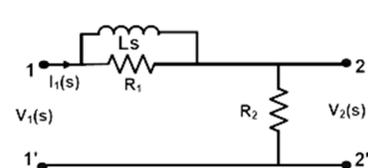


Fig. 17

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: EEPC2002

3rd Semester Regular/Back Examination: 2025-26
SUBJECT: ELECTRICAL MACHINES – I
BRANCH(S): EE, EEE, ELECTRICAL
Time: 3 Hours
Max Marks: 100
Q.Code: U674

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)
- a) Explain Lenz's law and its physical significance.
 - b) Define permeability and reluctance.
 - c) What is critical field resistance? Define critical speed of a DC generator.
 - d) Why interpoles are used in DC machines? How their polarities differ from generator to motor?
 - e) Why is a starter required for a DC motor?
 - f) A DC generator is found to develop an armature voltage of 220 V. If the flux is reduced by 25 % and speed is increased by 40 %, what will be the armature generated voltage?
 - g) What is all-day efficiency? Where is it used?
 - h) What is the purpose of open circuit test? What information is obtained from short circuit test?
 - i) Mention two advantages of an auto-transformer over a two-winding transformer.
 - j) List two advantages of three-phase transformers over single-phase transformers.

Part-II

- Q2** Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)
- a) Explain the B–H curve of a magnetic material and discuss its importance in electrical machines.
 - b) Explain the process of EMF build-up in a self-excited DC generator.
 - c) A 4-pole wave wound DC generator has 51 slots on its armature and each slot has 24 conductors. The flux per pole is 0.01 weber. At what speed must the armature rotate to give an induced EMF of 220 V. What will be the EMF developed if the winding is lap connected and the armature rotates at the same speed?
 - d) Draw and compare the load characteristics of different types of DC generators.
 - e) What do you understand from the term armature reaction? Describe the role of compensating windings in a DC generator.
 - f) A 220 V shunt motor having armature resistance of 0.4 Ω takes an armature current of 30 A on a certain load. By how much must the main flux be reduced to raise the speed by 30 % if the developed torque is constant? Neglect saturation and armature reaction.

- g) Explain with neat sketch, the diagram of a 3-point starter and its principle of operation.
- h) A 440 V, DC shunt motor takes no load current of 2.5 A. The resistance of shunt field and armature are 550 Ω and 1.2 Ω respectively. The full load line current is 32 A. Determine the full load efficiency of the motor.
- i) Discuss the working principle of single-phase transformer and also explain the constructional details.
- j) What are the conditions for parallel operation of two single phase transformers?
- k) Explain Scott connection with a neat diagram and mention its applications.
- l) A 3-phase transformer bank consisting of three 1-phase transformers is used to step-down the voltage of a 3-phase, 6600 V transmission line. If primary line-current is 10 Amp, calculate the secondary line voltage, line current, and output KVA for the following connections. I) Y/Delta and II) Delta/Y. The turn's ratio is 12. Neglect losses.

Part-III

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

- Q3** What are the benefits of parallel operation of DC generators? Explain the conditions and procedure for parallel operation of two DC compound generators. Also, discuss the use of equalizer bar. **(16)**
- Q4** What is DC motor? Derive its torque equation. Draw the speed-torque characteristics of DC shunt, series and compound motors in one figure and compare them. Which characteristic is more suitable for traction purposes and why? **(16)**
- Q5** The OC and SC test data of 4 kVA, 200/400 V, single phase transformer when supplying full load at 0.8 lagging p.f. is given below.
 OC test: 200 V, 0.8 A, 70 W (HV open circuit)
 SC test: 20 V, 10 A, 60 W (LV short circuit)
 Calculate efficiency at a) full load, b) $\frac{1}{2}$ Full load and c) Voltage regulation at Full load. **(16)**
- Q6** What is meant by vector group of a transformer? Draw the phasor diagrams and winding connections of three phase transformer for,
 a) Phase displacement of zero degrees.
 b) Phase displacement of minus 30 degrees. **(16)**

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Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)/B.Tech
Sub_Code: HSHS2001, REN3E001

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Engineering Economics

BRANCH(S): ALL

Time: 3 Hours

Max Marks: 100

Q.Code: U523, U524

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)

- What happens to the total revenue of a commodity when its demand is elastic and its price falls?
- How do expectations of future prices affect present market equilibrium?
- How does the availability of close substitutes affect the price elasticity of demand?
- Why does the average fixed cost continuously fall as output increases?
- State the relationships between average product and marginal product
- Why is the average cost U-shaped in the short run?
- What is the Sum-of-Years-Digits (SOYD) method?
- Write the difference between nominal and effective interest rates?
- What happens if the time value of money is ignored in investment decisions?
- Mention two important functions of a commercial bank.

Part-II

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

- Explain the concept of long-run returns to scale. Distinguish between increasing, constant, and decreasing returns to scale with the help of a diagram.
- Using cost and revenue concepts, explain how a firm determines its optimum level of output.
- Explain how break-even analysis helps management in decision-making.
- Describe the concept of normal profit and justify why firms earn only normal profit in the long run under perfect competition.
- Determine the price and output under a monopoly. Illustrate your answer with a suitable diagram.
- A project requires an initial investment of ₹1,50,000 and yields annual benefits of ₹45,000 for 5 years. Using a 10% interest rate, calculate the Present Worth (PW) and decide whether to accept the project.

- g) Define the concept of Internal Rate of Return (IRR) and calculate the IRR for a project with an initial investment of ₹50,000 and annual benefits of ₹20,000 for 3 years. Discuss whether the project is acceptable if the minimum attractive rate of return is 12%.
- h) Discuss the methods of measuring National Income.
- i) Analyse the causes and economic effects of inflation in a developing economy
- j) Explain the nature and scope of economics and distinguish between microeconomics and macroeconomics.
- k) A country reports the following data (₹ crores):
GDP at market price = ₹2,50,000
Indirect taxes = ₹15,000
Subsidies = ₹5,000
Depreciation = ₹20,000
1. Calculate GDP at factor cost.
 2. Calculate Net Domestic Product at market prices.
 3. Calculate Net Domestic Product at factor cost.
- l) Critically analyse the differences between demand-pull and cost-push inflation?

Part-III

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

- Q3 Discuss the different determinants of demand and supply, and explain how changes in these determinants shift the demand and supply curves. Illustrate with diagrams. (16)
- Q4 Write the features of different market structures. Discuss the determination of price and output in the cases of perfect competition and monopoly market using diagrams. (16)
- Q5 Analyse the strengths and limitations of the Internal Rate of Return (IRR) method when used for evaluating engineering projects with non-conventional cash flows. (16)
- Q6 Explain the functions of the central bank, including monetary policy tools, and its role in maintaining economic stability. (16)

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: CIPC2002

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: ENGINEERING SURVEY

BRANCH(S): CE, C&EE, CIVIL, ENV

Time: 3 Hours

Max Marks: 100

Q.Code: U617

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)

- What is meant by reconnaissance survey?
- Distinguish between survey station and tie station.
- Define departure of a line.
- If the whole circle bearing of a line is 232° , then estimate its quadrantal bearings.
- Define reduced level.
- What is a contour line?
- What is meant by well-conditioned triangle?
- Enlist the major characteristics of Tacheometer.
- List key advantages of a digital theodolite over a conventional theodolite?
- What is the principle of Electronic Distance Measurement in surveying?

Part-II

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

- Explain the method of reciprocal ranging in detail.
- A steel tape of nominal length 50 m was standardized at a temperature of 20°C and a pull of 100 N. This tape was used to measure a distance of 42.50 m on-site, where the temperature was 32°C and the applied tension was 150 N. Calculate the true horizontal length of the measured line.
- List the fundamental principles of surveying and provide a detailed description of any two of them.
- A survey line PQR crosses a wide canal. Point Q is on the near bank and R is on the far bank. A perpendicular QS = 120 meters is set up at Q towards the right of the line. From point S, the bearings of R (the far bank) and P (a point on the line behind Q) are observed to be 35° and 125° respectively. If the chainage of P is 850 meters and that of Q is 1100 meters, calculate the chainage of point R.
- Define closing error. Describe the various plotting methods used in a compass traverse.
- Write a short note on: sensitivity of level tube.

- g) Illustrate the common sources of error in levelling.
- h) Discuss the primary uses of a contour map.
- i) What is difference between line of collimation and line of sight?
- j) Enlist and describe the steps involved in the temporary adjustments of a theodolite survey.
- k) Detail the steps involved in Rankine's Method for horizontal curve setting.
- l) What are 'face left' and 'face right' observations? Why is it necessary to take both face observations?

Part-III

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

- Q3** In a property survey for a proposed building site, the following observations were made for a closed traverse PQRST. Calculate the closing error and adjust the latitudes and departures using Bowditch's Rule. **(16)**

Line	PQ	QR	RS	ST	TP
Length in m	125.50	188.20	145.60	172.40	138.80
WBC	30°15'	110°45'	195°30'	260°15'	345°00'

- Q4** In a topographic survey for a proposed pipeline route, a series of thirteen consecutive readings were recorded using a dumpy level. The observed staff readings, in meters, are: 1.250, 1.865, 2.330, 1.105, 1.625, 2.890, 0.955, 1.340, 2.050, 2.765, 0.445, 1.550, and 2.115. During the leveling operation, the instrument was shifted to new positions after the 3rd, 6th, and 10th readings were taken. Given that the Reduced Level (RL) of the initial point, established as a Benchmark, is 250.000 m, perform the following: a) Enter the data into a standard Level Book; b) Compute the Height of Instrument (HI) for each setup; c) Determine the Reduced Levels (RL) for all surveyed points; d) Verify the accuracy of the calculations by applying the standard arithmetic checks. **(16)**

- Q5** The following observations were taken with a tacheometer fitted with an anallactic lens. The multiplying constant is 100. Calculate: a) The distance AP, BP, and BQ b) The R.L. of points A, B, and Q and c) The gradient of line AB, and AQ. **(16)**

Instrument Station	Height of Instrument	Staff Station	Vertical Angle	Hair Readings	Remarks
P	1.60	A	3°45'	0.985, 1.485, 1.985	R.L. of P = 150.00 m
P	1.60	B	8°30'	1.420, 2.120, 2.820	
B	1.45	Q	-5°30'	1.750, 1.950, 2.155	

- Q6** a) What is GPS? Compare and contrast absolute positioning and differential positioning. **(8 + 8)**
 b) What is remote sensing? List out the various application of remote sensing.

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: MEPC2002

3rd Semester Regular/Back Examination: 2025-26
SUBJECT: Engineering Thermodynamics
BRANCH(S): MECH, MMEAM
Time: 3 Hours
Max Marks: 100
Q.Code: U676

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)
- Write the steady-flow energy equation for a control volume. Mention the assumptions considered for steady flow energy equation.
 - What are the sources of irreversibility in thermodynamic systems?
 - Can entropy of a system decrease? Under what condition?
 - What is meant by the quality of energy?
 - What is the significance of the reference environment in exergy analysis?
 - List the basic components of a Rankine cycle power plant.
 - Why is the Carnot vapour cycle impractical for steam power plants?
 - What are the TdS relations?
 - What is the cut-off ratio in a diesel cycle?
 - Define volumetric efficiency of a compressor.

Part-II

- Q2** Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)
- Explain the difference between energy balance and entropy balance in a thermodynamic system.
 - Steam enters a turbine at 3 MPa and 400 °C with a velocity of 50 m/s and enthalpy of 3230 kJ/kg and leaves at 50 kPa and 100 °C with a velocity of 100 m/s and enthalpy of 2676 kJ/kg. The mass flow rate is 5 kg/s. Neglect potential energy change. Determine: (i) Power output of the turbine, and (ii) Heat transfer rate if the turbine is not adiabatic.
 - A closed system receives 500 kJ of heat from a reservoir at 800 K while rejecting 200 kJ of heat to the surroundings at 300 K. Determine: (i) Change in entropy of the system, and (ii) Entropy generation.
 - Explain the First law analysis of transient flow for filling and emptying of a tank.
 - A 50 kg block of iron casting at 500 K is thrown into a large lake which is at temperature of 285 K. After the iron block reaches thermal equilibrium with the lake, determine (i) Entropy change of iron block, (ii) Entropy change of lake water, and (iii) Total entropy change during this process. Assume average specific heat of iron block as 0.45 kJ/kg K.

- f) Derive the expression for thermal efficiency of the Rankine cycle. Highlight the various methods of increasing Rankine cycle efficiency.
- g) Explain the reheat Rankine cycle with T–s diagram and discuss its advantages.
- h) Derive the Maxwell relations starting from the fundamental thermodynamic equations.
- i) Explain the Joule–Thomson effect and derive an expression for the Joule–Thomson coefficient.
- j) Explain the simple Brayton cycle with P–V and T–S diagrams. Discuss the effect of pressure ratio on the performance of the Brayton cycle.
- k) Describe the construction and working of a single-stage reciprocating air compressor with a neat sketch.
- l) Derive the condition for optimum intercooler pressure in a two-stage compressor.

Part-III

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

- Q3** a) Explain the limitations of the First Law and how the Second Law overcomes them. **(8 + 8)**
- b) In an air compressor air enters at a 4 m/s, 1 bar, 0.5 m³/kg. The exit conditions 7 m/s, 6 bar, 0.12 m³/kg. The internal energy of air is gained after compression process is 38 kJ/kg. The system losses 3000 kJ/min of heat to surroundings during process. Mass flow rate of air is 30 kg/min. Calculate (i) shaft work input, (ii) ratio of inlet to outlet areas.
- Q4** a) In steady flow system, the air enters system at 12 bar, 200 °C with velocity of 150 m/s, and after adiabatic process it leaves system at 1.2 bar, 25 °C with velocity 60 m/s. The surrounding pressure and temperature are 1 bar and 25 °C respectively. Determine reversible work. Assume $C_p = 1.005 \text{ kJ / kg K}$ and $R = 0.287 \text{ kJ / kg K}$. **(8 + 8)**
- b) Expansion of gas takes place in a turbine from 8 bar, 550 °C to 1 bar, 350 °C. The 6 kJ of heat per kg is rejected to the surroundings during process. Surrounding temperature and pressure are 20 °C and 0.98 bar respectively. Calculate per kg of gas (i) change of availability (ii) maximum work (iii) irreversibility.
- Q5** a) Consider a steam power plant operating on the simple ideal Rankine cycle. Steam enters the turbine at 3 MPa and 350 °C and is condensed in the condenser at a pressure of 75 kPa. If the isentropic efficiency of the turbine is 87 percent and the isentropic efficiency of the pump is 85 percent, determine (i) the thermal efficiency of the cycle, and (ii) the net power output of the plant for a mass flow rate of 15 kg/s. **(8 + 8)**
- b) Explain the concept of cogeneration and its importance in modern power plants.
- Q6** a) A gas-turbine power plant operating on an ideal Brayton cycle has a pressure ratio of 8. The gas temperature is 300 K at the compressor inlet and 1300 K at the turbine inlet. Assuming a compressor efficiency of 80 percent and a turbine efficiency of 85 percent, determine (i) the back work ratio, (ii) the thermal efficiency, and (iii) the turbine exit temperature of the gas-turbine cycle. **(8 + 8)**
- b) Explain why multistage compression reduces power consumption.

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code CIPC2003

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Fluid Mechanics

BRANCH(S): C&EE, CIVIL, ENV, CE

Time: 3 Hours

Max Marks: 100

Q.Code: U677

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 specific volume and specific gravity of a fluid.
- Define pascal's law.
- What do you understand by total pressure and center of pressure?
- Differentiate between Stream line, path line, and streak line.
- What are the different types of forces involved in Euler's equation?
- Differentiate between rotational and irrotational motion.
- Give a brief note on application of Pitot tube.
- Enlist the types of hydraulic coefficients.
- List out the characteristics of laminar flow.
- List out the minor losses those happen in pipe.

Part-II

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

- Find out the minimum size of glass tube that can be used to measure water level if the capillary rise in the tube is to be restricted to 2 mm. Consider surface tension of water in contact with air as 0.073575 N/m.
- An oil of viscosity of 0.50 N-S/m² is used for lubrication between a shaft and a sleeve. The diameter of shaft is 0.50 m and it rotates at 200 rpm. Find the power lost in oil for a sleeve length of 100 mm. The thickness of the oil film is 1 mm.
- Derive an Expression for total pressure force and depth of pressure for a vertical surface submerged in water.
- A block of wood of specific gravity 0.7 floats in water. Determine the metacentric height of the block if its size is 2 m × 1 m × 0.8 m.
- If for a two- dimensional potential flow, the velocity potential is given by $\phi = x(2y - 1)$ Determine the velocity at the point p (4, 5). Also determine the value of stream function Ψ at the point P.
- Write in detail about the classification of orifices.

- g) State Bernoulli's equation? Write the assumptions for such a derivation?
- h) Briefly explain about the Viscometer.
- i) Write Short note on water hammer in pipe.
- j) Explain the concept of equivalent pipe when many pipes are connected in series.
- k) Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula, (ii) Chezy's formula for which $C = 60$.
- l) Obtain an expression for Velocity distribution in turbulent flow for smooth pipe.

Part-III

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

- Q3** Determine the total pressure and Centre of pressure on an isosceles triangular plate of base 5 m and altitude 5 m when the plate is immersed vertically in an oil of specific gravity 0.8. The base of the plate is 1 m below the free surface of oil. **(16)**
- Q4** a) Derive the expression for rate of flow through the venturimeter? **(8 + 8)**
 b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturimeter is 60 lit/s. Find the reading of oil-mercury differential manometer. (Take $C_d = 0.9$).
- Q5** a) Define hydraulic gradient line and energy gradient line in a pipe with sketch. **(4 + 12)**
 b) Two tanks containing water are connected by a horizontal pipe of length 25 m and diameter 20 cm. If the difference of water surface in the reservoir is 4 m, find the rate of flow. Also draw the energy gradient line and hydraulic gradient line. (Take Darcy's friction factor $f = 0.01$).
- Q6** Briefly explain the laminar fluid flow in parallel plates when both plates at rest and one plate at rest and other moving. **(16)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RME3C002

3rd Semester Back Examination: 2025-26
SUBJECT: Fluid Mechanics and Hydraulic Machines
BRANCH(S): C&EE, CIVIL, MECH, MMEAM
Time: 3 Hours
Max Marks: 100
Q.Code: U716

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)

- a) Define viscosity and kinematic viscosity of a fluid.
- b) What is center of buoyancy?
- c) Define stream function.
- d) What is a hydraulic jump?
- e) State the assumptions made in deriving Euler's equation of motion.
- f) List the factors affecting head loss due to friction in pipes.
- g) Distinguish between steady flow and unsteady flow.
- h) Define specific speed of a turbine.
- i) What is overall efficiency of a centrifugal pump?
- j) Define coefficient of velocity of an orifice.

Part-II

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

(6 x 8)

- a) Explain Newton's law of viscosity. Draw shear stress–velocity gradient curves for Newtonian and non-Newtonian fluids with suitable examples
- b) Two parallel plates are placed 10 mm apart. The lower plate is stationary and the upper plate moves with a velocity of 2 m/s. Determine the viscosity of the fluid if the shear stress is 4 N/m².
- c) Explain any two devices used for measurement of pressure in fluids.
- d) A vertical rectangular plate 4 m wide and 5 m high is immersed in water such that its top edge is 8 m below the free surface. Determine
 - i) Total pressure on the plate
 - ii) Position of center of pressure.
- e) Derive the continuity equation for three-dimensional incompressible flow in Cartesian coordinates.
- f) Derive Bernoulli's equation for real fluid flow along a streamline.

- g) Define the following:
- i) Uniform flow and non-uniform flow
 - ii) Compressible and incompressible flow.
- h) Water flows through a horizontal pipe of 200 mm diameter at a velocity of 3 m/s. The pipe suddenly contracts to 100 mm diameter. Determine
- i) Loss of head due to contraction
 - ii) Pressure drop across contraction
 - iii) Power loss.
- i) Derive an expression for hydraulic efficiency of a Pelton turbine.
- j) A Pelton wheel develops power under a head of 250 m with a discharge of 0.6 m³/s. The jet is deflected through 165°. Find the power developed and hydraulic efficiency if bucket speed is 11 m/s.
- k) Write short notes on
- i) Kaplan turbine
 - ii) Francis Turbine
- l) Define priming and explain its necessity.

Part-III

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

- Q3 Derive an expression for the metacentric height of a floating body in terms of the geometry of the body and fluid properties. (16)
- Q4 Two pipes are connected in parallel between two reservoirs. The lengths of both pipes are 1500 m. Diameters are 0.9 m and 0.6 m respectively. If the total discharge is 2.5 m³/s and friction factor is same for both pipes, determine the discharge through each pipe. (16)
- Q5 a) With a neat sketch, explain the working principle of a centrifugal pump. (8 x 2)
- b) Derive an expression for manometric efficiency.
- Q6 The velocity components of a two-dimensional flow are given by $u = 2x + y$, $v = x - 2y$. Determine: (16)
- a) The acceleration components at point (2, 1)
 - b) Whether the flow is rotational or irrotational.

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: MFPC2002

3rd Semester Regular/Back Examination: 2025-26
SUBJECT: Introduction to physical Metallurgy and Engineering Materials
BRANCH(S): AUTO, MANUTECH, MECH, MMEAM, ME
Time: 3 Hours
Max Marks: 100
Q.Code: U620

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)
- Draw $(\bar{1} 0 1)$ and $(\bar{1} \bar{1} 0)$ in a cubic lattice.
 - Classify engineering materials with suitable examples.
 - Mention any four important properties of engineering materials.
 - Name two crystal structures of metals with one example each.
 - What is crystallization? Mention its two main stages.
 - What are point defects? Give two examples.
 - State any two effects of cold working on material properties.
 - Draw $[\bar{1} \bar{2} 1]$ and $[1 0 \bar{2}]$ in a cubic lattice.
 - Define burgers vector and what is perfect dislocation?
 - What is tempering? Why is it required after hardening?

Part-II

- Q2** Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)
- What is space lattice? Write all the crystal systems and their lattice parameter relations.
 - Write short note on stacking fault.
 - What is hardenability? Explain the factors affecting hardenability.
 - Explain plastic deformation by slip and twinning.
 - Differentiate between thermosetting plastics and thermoplastics based on their structure, properties, and applications.
 - Explain hot working process and compare it with cold working.
 - Explain pure metals, intermediate alloy phases, and solid solutions.
 - Explain substitutional and interstitial solid solutions with examples.
 - Explain Hume-Rothery rules for formation of solid solutions.
 - Calculate the ideal c/a ratio for HCP crystal structure.
 - Explain the atomic packing factor (APF) for FCC and BCC structures.
 - Write short note on vacancy.

Part-III

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

- Q3** Discuss various strengthening mechanisms in metals. (16)
- Q4** Explain recovery, recrystallization, and grain growth in cold-worked metals. (16)
- Q5** Neatly draw the iron-cementite phase diagram and write the phases and all the invariant reactions present in it. If a slowly cooled plain carbon steel shows pro-eutectoid cementite to be ten percent by weight of the microstructure, then what is the carbon percentage in the steel? (16)
- Q6** What is annealing? Explain the different types of annealing processes and their purposes in improving the properties of metals. (16)

Registration No.:

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Total Number of Pages:02

Course: IDD/B.Tech
Sub_Code: HSBS2001

3rd Semester Regular/Back Examination: 2025-26
SUBJECT: Mathematics-III

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

Time: 3 Hour
Max Marks: 100
Q.Code:U495

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)
- Write the existence conditions of Laplace transform method.
 - Determine the Laplace transform of 9^t .
 - Write the one dimensional wave equation and one dimensional heat equation.
 - Define Fourier series for the function having period 2π .
 - Find the mean of the random variable X with the probability function $f(x) = 2x$.
 - Define moment of the random variables
 - Find the probability of getting exactly 2 heads in 6 tosses of a fair coin.
 - Explain Normal distribution with an example.
 - Define random sample of size n .
 - Write two properties of correlation coefficients.

Part-II

- Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)
- State and prove second shifting theorem.
 - Use convolution theorem to find $L^{-1}\left\{\frac{1}{(s^2-5s+6)}\right\}$.
 - Solve the differential equation $y'' + 5y' + 6y = \delta(t)$.
 - Find the Fourier series of the function $f(x) = -1(-1 < x < 0)$, $f(x) = 1(0 < x < 1)$ $P=2L=2$.
 - Solve the boundary value problem $\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}$, $u(0, t) = u(3, t) = 0$ and $u(x, 0) = 5 \sin 4\pi x - 3 \sin 8\pi x$.
 - Show that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$

- g) Two ball point pens are selected at random from a box that contains 3 blue pens, 2 red pens and 3 green pens. If X is the number of blue pens selected and Y is the number of red pens selected, find the joint probability function $f(x, y)$.
- h) Is continuous random variable X , having probability density function
- $$f(x) = \begin{cases} \frac{x^2}{3}, & -1 < x < 2 \\ 0, & \text{otherwise} \end{cases} ? \text{ Find } P(0 < X \leq 1).$$
- i) Find the mean and variance of Normal distribution.
- j) The probability that a patient recover from a rare blood disease is 0.4. If 5 people are known to be contaminated the disease, what is the probability that
 (i) At least 10 people survive. (ii) Exactly 5 people survive.
- k) Establish the relation between sampling distribution and central limit theorem.
- l) Explain maximum likelihood estimation of the parameters with a suitable counterexample.

Part-III

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

- Q3 (a) Use Laplace transform method to solve the initial value problem: $y'' + y = t^2 + 2t, y(0) = 4, y'(0) = -2$. (16)

(b) Solve the integral equation $y = \sin t - \int_0^t y(\tau) \sin(t - \tau) d\tau$.

- Q4 a) Find the solution of the heat conduction problem $\frac{\partial u}{\partial t} = K \frac{\partial^2 u}{\partial x^2}, 0 < x < e, t > 0,$
 $u(0, t) = 0, \forall t \geq 0, u(e, t) = 0, \forall t \geq 0, u(x, 0) = f(x), 0 \leq x \leq e$. (16)

(b) Define probability distribution function for discrete random variables. Find the probability distribution of boys and girls in families with 3 children, assuming equal probabilities for boys and girls.

- Q5 (a) Show that the mean and variance of the binomial distribution $b(x; n, p)$ are $\mu = np$ and $\sigma^2 = npq$. (16)

(b) Let X and Y be two independent random variables. Then show that $E(XY) = E(X)E(Y)$.

- Q6 (a) The grade of a class 9 students on a midterm report (x) and the final examination (y) as follows (16)

x	77	50	71	72	81	94
y	82	66	78	34	47	85

Estimate the linear regression line.

- (b) Compute and interpret the correlation coefficient for the following data of 6 students selected at random.

Mathematics grade	70	92	80	74	65	83
English grade	74	84	63	87	78	90

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: MEPC2001

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Mechanics of Solids

BRANCH(S): AERO, AUTO, C&EE, CIVIL, ENV, MANUTECH, MECH, MMEAM

Time: 3 Hours

Max Marks: 100

Q.Code: U565

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 the use of Mohr's circle?
- What do you mean by thermal stresses?
- A steel bar of 2 m long and 150 mm² in cross-section is subjected to an axial pull of 15 kN. Find the elongation of the bar ($E = 200$ GPa).
- State the relationship between shear force and bending moment at a section.
- What is point of contraflexure?
- A simply supported beam AB of span l and stiffness EI carries a concentrated load P at its centre. Find the expression for deflection of the beam at its centre.
- What is the difference between beam and column?
- Two closely coiled helical springs 'A' and 'B' are equal in all respects but the diameter of wire of spring 'A' is double that of spring 'B'. Find the stiffness ratio of spring 'B' to that of spring 'A'.
- What is a spring? State any two of its uses.
- State the assumptions in the Euler's Column Theory.

Part-II

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

(6 x 8)

- Derive the relation between the elastic constants (Young's modulus, modulus of rigidity, and bulk modulus).
- A delta strain rosette is mounted on the surface of a structural member. The measured strains along directions making angles of 0°, 60°, and 120° with the x-axis are 4.5×10^{-4} , -6×10^{-4} and 1.5×10^{-4} , respectively. Determine the principal stresses. Take, Young's modulus, $E = 200$ GPa, and Poisson's ratio, $\nu = 0.3$.
- Derive the relation between load rate, shear force, and bending moment in the SFD and BMD.
- Demonstrate Moment area method with an example.
- Using the theory of simple bending, derive the governing differential equation of a beam.

- f) For the beam shown in Fig.1, draw the shear force and bending moment diagrams.

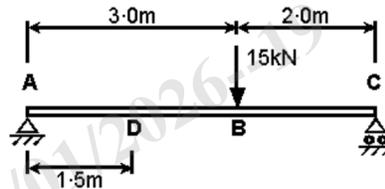


Fig. 1

- g) State the fundamental assumptions of the theory of torsion. Using these assumptions, derive the torsion equation for a circular shaft subjected to pure torsion:

$$\frac{T}{J} = \frac{G\theta}{l} = \frac{\tau}{R}$$

- h) A hollow steel shaft transmits 200 kW of power at 180 rpm. The total angle of twist in a length of 5 m of the shaft is 3° . Find the inner and outer diameters of the shaft if the permissible shear stress is 60 MPa. $G = 80$ GPa.
- i) A hollow shaft of external and internal diameter of 80 mm and 50 mm is required to transmit torque from one end to the other. What is the safe torque it can transmit, if the allowable shear stress is 45 MPa?
- j) A close-coiled helical spring having 24 turns is made of 8 mm diameter wire. The mean diameter of the spring is 80 mm and it carries a load of 250 N. Determine the shear stress developed, the deflection and stiffness of the spring. Take, $G = 84$ GPa.
- k) Define springs. Classify the different types of springs.
- l) Derive the Euler's crippling load for a column with one end fixed and another end free.

Part-III

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

- Q3 Draw the stress-strain diagram for the mild steel and cast iron. Explain the stress-strain diagram behaviour of both the curves. Also, explain the significance of different stress points for both the cases and indicate them on the curves. (16)
- Q4 A cantilever beam of length L is subjected to a uniformly varying load (UVL) along its span, as shown in the Fig. 2. Derive expressions for the slope and deflection of the beam at the fixed support. (16)

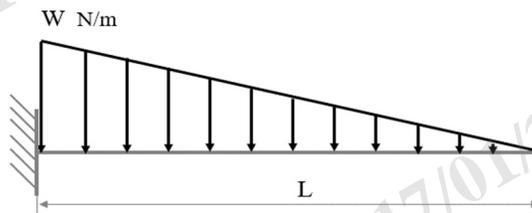


Fig. 2

- Q5 A solid shaft of 200 mm diameter has the same cross-sectional area as a hollow shaft of the same material with inside diameter of 150 mm. Find the ratio of (16)
- powers transmitted by both the shafts at the same angular velocity.
 - angles of twist in equal lengths of these shafts, when stressed to the same intensity.
- Q6 Derive a relation for the Euler's crippling load for a column when (16)
- it has both ends hinged, and
 - both ends fixed.

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: CSPC2003

3rd Semester Regular Examination: 2025-26
SUBJECT: OBJECT ORIENTED PROGRAMMING
BRANCH(S): CE, CSIT, CSE, CSE, CSEAI, CSEDS, CSEAIML, CST, IT

Time: 3 Hours
Max Marks: 100
Q.Code: U568

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)

- Define Object-Oriented Programming. Mention two of its advantages.
- What is type casting in Java? Provide an example.
- What is the purpose of this keyword in Java?
- What are access modifiers in Java? List them.
- What are the key differences between checked and unchecked exceptions?
- Define multithreading. List two advantages of using threads.
- What is the difference between byte streams and character streams in Java?
- Differentiate between containers and components in GUI programming.
- What is the difference between AWT and Swing?
- What is the role of a Scene Builder in JavaFX?

Part-II

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

- Compare C++ and Java in detail.
- Explain the process of compiling and executing a Java program.
- Discuss the use of command-line arguments with an example program.
- Explain the concept of constructors in Java with an example.
- Write a Java program to demonstrate single inheritance.
- Explain the differences between static and dynamic polymorphism.
- Describe the use and advantages of wrapper classes in Java.
- Describe the life cycle of a thread in Java.
- Write a program to demonstrate the use of abstract classes in Java.
- What is an applet? Mention its life cycle stages.

- k) Differentiate between containers and components in GUI programming.
- l) Discuss the hierarchy of Swing components in detail. Write a JavaFX program to create a simple graphical user interface.

Part-III

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

- Q3** Write a Java program to implement a two-dimensional array and perform matrix addition. **(16)**
- Q4** Explain inheritance and its types in Java with examples. **(16)**
- Q5** Explain exception handling mechanisms in Java with suitable programs. **(16)**
- Q6** Write a detailed note on the collection framework and its significance in Java. **(16)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: ROP3B001

3rd Semester Back Examination: 2025-26

SUBJECT: Object Oriented Programming Using JAVA

BRANCH(S): AEIE, AG, AME, BIOTECH, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC, MANUTECH, MECH, METTA, MINING, MME, MMEAM, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: U733

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 the main difference between a compiler and an interpreter?
- What is the output of `System.out.println(5 + "10");` in Java?
- What is a constructor? Can it be inherited?
- What is the use of the final keyword in inheritance?
- Can an abstract class have a constructor?
- What is the difference between throw and throws?
- What is the difference between sleep () and yield () in threading?
- What is an event listener in AWT?
- Why is Swing called "lightweight"?
- What is the life cycle method of an applet that is called only once?

Part-II

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

(6 x 8)

- Explain the Java Virtual Machine (JVM) architecture with a neat diagram. Discuss its significance in platform independence.
- Write a Java program to check whether a given number is prime or not using command-line arguments.
- Write a Java program to demonstrate the use of all three loops (for, while, do-while) to print the first 10 natural numbers.
- Describe different types of inheritance supported in Java with examples. Why doesn't Java support multiple inheritance through classes?
- Programming: Create a class Employee with attributes id, name, and salary. Write a method to calculate the annual salary. Derive a class Manager with an additional attribute bonus. Override the salary calculation method to include bonus.

- f) Write a Java program to demonstrate constructor overloading and the use of this keyword in a class Book with attributes title, author, and price.
- g) What is an abstract class? How does it differ from an interface? When would you prefer an interface over an abstract class?
- h) Explain the exception hierarchy in Java. Differentiate between checked and unchecked exceptions with examples.
- i) Write a program to handle FileNotFoundException and IOException while reading a file. Use try-catch-finally blocks appropriately.
- j) Explain the JavaFX architecture and its advantages over Swing for modern GUI development.
- k) Explain the life cycle of an applet with a diagram. What are the limitations of applets?
- l) Create a simple AWT application with a TextField, Button, and Label. On clicking the button, display the entered text in the label.

Part-III

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

- Q3** Design a Java program to simulate a simple Student Grading System. The program should: **(16)**
- Take input for n students (name, marks in 3 subjects) using Scanner.
 - Calculate total, percentage, and grade (A, B, C, F).
 - Use arrays of objects to store student details.
 - Implement methods to display toppers and students who failed.
- Explain the memory allocation for objects and arrays in Java.
- Q4** Explain the concepts of encapsulation, inheritance, and polymorphism with real-world examples. Implement a class hierarchy for a University Management System with classes Person, Student, Faculty, and Staff. Use method overriding, super, this, and static members. Include constructors and demonstrate runtime polymorphism. **(16)**
- Q5** Discuss multiple inheritance in Java using interfaces. Explain diamond problem and how Java resolves it. Create a system for Electronic Devices using: **(16)**
- Interface Switchable (on/off), Chargeable.
 - Classes Fan, AC, Laptop.
 - Abstract class Device with common attributes.
 - Implement user-defined exceptions for invalid operations (e.g., charging a non-chargeable device).
- Q6** Explain multithreading in Java with life cycle, synchronization, inter-thread communication, and deadlock. Write a program to simulate a Producer-Consumer Problem using wait() and notify(). Use ArrayList as shared buffer. **(16)**

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: PCAC2001

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Python Programming

BRANCH(S): AE, AERO, AUTO, C&EE, CHEM, CIVIL, CSE, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC, MANUTECH, MECH, METTA, MINERAL, MINING, MME, MMEAM, PLASTIC, CE, EE

Time: 3 Hours

Max Marks: 100

Q.Code: U719

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)

- a) What is the purpose of indentation in Python?
- b) Write the output of the following code:

```
x = 10
y = 3
print(x // y)
print(x % y)
```
- c) What is the difference between == and = in Python?
- d) Write the output of:

```
for i in range(1,5,2):
    print(i,end=" ")
```
- e) Define a variable. Give one example.
- f) What is a tuple? Mention one property.
- g) What is the use of break statement?
- h) Write the output:

```
a = [1,2,3]
a.append(4)
print(len(a))
```
- i) Write the output:

```
s = "Python"
print(s[1:4])
```
- j) Write the output:

```
x = 5
if x > 2:
    print("Yes")
else:
    print("No")
```

Part-II

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

- a) Write a Python program to check whether a number is even or odd.
- b) What is a list? Explain any four list operations.
- c) Write a Python program to find the largest number in a list.
- d) Write a program that accepts a sentence from the user, counts how many times each word appears, and stores the result in a dictionary, and displays it.
- e) Write a program to make a student result system that accepts a student's name and marks of 5 subjects, calculates the total, percentage, and grade, and displays the complete result in a formatted form.
- f) Write a program to accept two matrices, perform addition and subtraction and display the resulting matrices
- g) Write a program to check whether a given password is valid based on a minimum of 8 characters, at least one uppercase letter, at least one digit, and at least one special character.
- h) Explain the concept of functions in Python with an example.
- i) Write a Python program to generate the Fibonacci series.
- j) Explain file handling in Python.
- k) Differentiate between a list and a tuple.
- l) Explain dictionaries in Python with an example.

Part-III

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

- Q3**
- a) Write a Python program that accepts a list of integers from the user, removes duplicate elements, sorts the list in ascending order, and displays the final list. Explain the program with proper comments. (8)
 - b) Write a Python program to read a text file and count the number of words, count number of lines, and the number of characters. Explain the working of the program. (8)
- Q4**
- a) Write a Python program using a dictionary to store student roll numbers and marks. The program should allow insertion of data, search for a student using roll number, and display the grade based on marks. Explain the logic of the program. (8)
 - b) Write a Python program to access web data from a given URL using urllib, extract the text content, and display the number of hyperlinks present on the page. Explain the role of web scraping in Python. (8)
- Q5**
- a) Write a program to store student records in a CSV file, read and display the records, and search a student by roll number. (8)
 - b) Write a program that takes a URL from the user, downloads the web page, and counts number of words on that page. (8)
- Q6**
- a) Write a menu-driven program to simulate an ATM with options: check balance, deposit money, withdraw money, & Exit. (8)
 - b) Write a program that stores username and password in a dictionary, allows the user to log in, & displays a success or failure message. (8)

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: PCAC2006

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Robotics: Motion Planning

BRANCH(S): CIVIL, CSE, ECE, EEE, ELECTRICAL, ETC, MECH, METTA

Time: 3 Hours

Max Marks: 100

Q.Code: U720

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) Define artificial potential field method.
 - b) What is the role of IMU sensors in quadrotor navigation?
 - c) What do you mean by cluttered environments in drone navigation?
 - d) What is meant by degrees of freedom (DOF) in quadrotors?
 - e) What is meant by noisy sensor data?
 - f) Define the attitude control of a quadrotor.
 - g) Define free space in configuration space.
 - h) Define Probabilistic Road Map (PRM).
 - i) What is the role of feedback control in quadrotor flight?
 - j) What is collision detection in robot motion planning?

Part-II

- Q2** Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)
- a) Describe the working principle of a quadrotor UAV and explain how lift and control moments are generated.
 - b) Explain the challenges of localization using noisy sensors in autonomous aerial robots.
 - c) Discuss the control strategies used in multi-robot aerial systems.
 - d) Explain the key components of an autonomous flight system with a neat block diagram.
 - e) Describe various design considerations involved in developing micro aerial vehicles.
 - f) Discuss time, motion, and trajectory planning for drones operating in 3D environments.
 - g) Describe the concept of configuration space with a suitable example of a planar robot.
 - h) Explain the role of perception systems in robotic motion planning. Discuss how sensor data is processed and integrated with decision and control systems to enable autonomous navigation in aerial robots.

- i) Discuss collision detection and free space sampling methods used in robotic motion planning.
- j) Explain sampling-based planning methods and compare them with graph-based methods.
- k) Explain the three main components of a robotic system and discuss their role in motion planning.
- l) Describe configuration space modelling for robot motion planning.

Part-III

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

- Q3** Describe the complete autonomy stack of an aerial robot, including sensing, estimation, planning, and control. **(16)**
- Q4** Explain different rotation representations used in UAVs. Discuss the advantages of axis-angle and quaternion methods over Euler angles. **(16)**
- Q5** With neat diagrams, explain Graph-based planning methods and Sampling-based planning methods. Compare their performance, advantages, and limitations. **(16)**
- Q6** Explain motion planning in robotics in detail. Discuss the challenges involved in motion planning, such as high dimensionality, obstacle avoidance, and uncertainty. **(16)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD
Sub_Code: HSHS2002

3rd Semester Regular/Back Examination: 2025-26

SUBJECT: Organizational Behaviour

BRANCH(S): CSE, EE, AEIE, AI, AUTO, BIOMED, BIOTECH, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRONICS & C.E, ENV, ETC, MECH, METTA, MINERAL, MINING, MME

Time: 3 Hours

Max Marks: 100

Q.Code: U526

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 organisational behaviour.
- State any two barriers to changing attitudes.
- What are personality tests?
- Explain the concept of selective perception.
- What do you mean by organisational culture and climate?
- Mention any two benefits of work teams.
- Define the benefits of a learning organisation.
- State one impact of the halo effect on employees' performance appraisal.
- Why do managers make attribution errors?
- Distinguish between a group and a team.

Part-II

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

(6 x 8)

- Discuss the limitations of organisational behaviour as a discipline.
- Explain personality and its significance for individual performance at work.
- Illustrate intervention strategies for facilitating organisational change.
- Discuss Maslow's Need Hierarchy Theory and its relevance in organisations.
- Examine team effectiveness and the importance of team building.
- Distinguish between soft and hard culture.
- Discuss Kotter's Eight-Step Model for implementing organisational change.
- Explain the Porter-Lawler model in detail.
- What do you mean by personality tests? Discuss its practical applications.
- Discuss the five stages of group development with examples.
- Explain the process of creating and sustaining organisational culture.
- Explain the role of leadership in successful change implementation.

Part-III

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

- Q3** Explain the concept of attitude and its components. Discuss the relationship between attitude and behaviour. (16)
- Q4** Explain the Myers–Briggs Type Indicator and the Big Five personality model. Compare their usefulness in organisations. (16)
- Q5** “Managers who understand human behaviour perform better than those who rely only on rules and procedures.” Examine this statement in the context of organisational behaviour. (16)
- Q6** Explain why group norms and cohesiveness play a critical role in team performance. (16)