



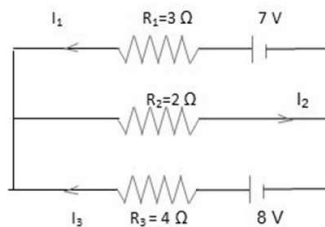
	WINTER-2023		
	Exam Seat No.:		
	Academic Year: 2023-2024	Semester: I	
	Name of Programme: F.Y.B.Tech	Pattern:2023	
	Name of Course: Linear Algebra and Differential Calculus	Course Code:2300101A	
	Max. Marks:60	Duration:2.30Hr	

	<p>Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.</p> <ol style="list-style-type: none"> 1. This question paper contains 3pages. 2. Answer to each new question is to be started on a new page. 3. Assume suitable data wherever required, but justify it. 4. Draw the neat labelled diagrams, wherever necessary. 5. Use of non-programmable pocket calculator is allowed. 6. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question. 	
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Question No. 1 Attempt following Question

- 1 Determine the current in the network given in fig.

(6) CO3



Question No. 2 Attempt following Question

- 2 Reduce the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ to diagonal form, also write Modal Matrix and Spectral Matrix.

(6) CO3

Question No. 3 Attempt following Question

- 3.a) If $z^3 - zx - y = 4$ find $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$

(4) CO2

OR

- 3.b) If $u = \log(x^2 + y^2)$ then prove that $u_{xy} = u_{yx}$.

(4) CO2

3.c) If $z = \sin\left(\frac{y}{x}\right) + \sqrt{x^2 + y^2}$ Then show that, $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = \sqrt{x^2 + y^2}$. (6) CO3

OR

3.d) If $u = \log\left(\frac{x^5 + y^5}{x^2 + y^2}\right)$ Prove that, $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -3$ (6) CO3

3.e) If $z = f(u, v)$ where $u = x^2 + y^2, v = 2xy$ show that $x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y} = 2\sqrt{u^2 - v^2} \frac{\partial z}{\partial u}$ (6) CO3

OR

3.f) If $u = f(x^2 - y^2, y^2 - z^2, z^2 - x^2)$ then show that $\frac{1}{x} \frac{\partial u}{\partial x} + \frac{1}{y} \frac{\partial u}{\partial y} + \frac{1}{z} \frac{\partial u}{\partial z} = 0$ (6) CO3

Question No. 4 Attempt following Question

4.a) If $x = u + v, y = v^2 + w^2, z = w^3 + u^3$, Find $\frac{\partial u}{\partial x}$ (5) CO3

OR

4.b) If $u = \sin^{-1} x + \sin^{-1} y, v = x\sqrt{1 - y^2} + y\sqrt{1 - x^2}$ Verify whether u and v are functionally dependent, if so, find the relation between them. (5) CO3

4.c) The period of simple pendulum is $T = 2\pi\sqrt{\frac{l}{g}}$, find the percentage error in T due to possible error up to 1% in l and 2.5% in g. (5) CO5

OR

4.d) The focal length of mirror is found from $\frac{2}{f} = \frac{1}{v} - \frac{1}{u}$. Find the percentage error in f given u and v are both of error 2% each. (5) CO5

4.e) Discuss the conditions of maxima & minima for the function (6) CO5

$$f(x, y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$$

OR

4.f) Find the points on the surface $z^2 = xy + 1$ nearest to the origin by using Lagrange's method. (6) CO5

Question No. 5 Attempt following Question

5.a) A student is to answer 10 out of 13 questions in an exam. (5) CO2

- i) How many choices has he, if he must answer the first or second question but not both.
- ii) How many choices has he, if he must answer exactly 3 out of first 5 questions.

OR

5.b) A room has three electric lamps. From a collection of 10 electric bulbs of which 6 are good, three are selected at random and put in the lamps. Find the probability that the room is lighted. (5) CO2

5.c) A committee of 10 students has to be selected from 8 boys and 6 girls .how many ways we can select committee member if (5) CO2

- i) A committee consist of same no of boys and girls
- ii) At least 3 girls are there

OR

- 5.d) If A and B are not mutually exclusive events, $P(A) = 1/4$ and $P(B) = 2/5$, and $P(A \cap B) = 1/2$ then find (5) CO2
- (a) $P(A')$
 - (b) $P(B')$
 - (c) $P(A \cap B)$
 - (d) $P(A \cap B')$
 - (e) $P(A' \cap B')$

- 5.e) In a bolt factory, machine A,B,C, manufacture 25%,35%,40% of the total of their output 5%,4%,2% are defective bolts. A bolt is drawn at random from the product and it found to be defective. What are the probabilities that it was manufactured by machine A,B,C? (6) CO3

OR

- 5.f) Given three identical boxes I,II,III each containing two coins. In box I both coins are gold , In Box II both are silver coins and in the box III there is one gold and one silver coin . A person chooses a box at random and takes out coin. If the coin is of gold , what is the probability that the other coin in the box is also gold. (6) CO3