



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

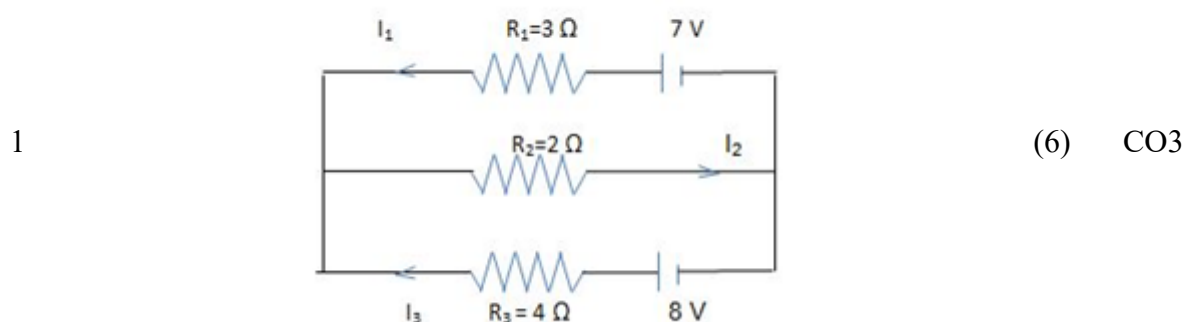
	SUMMER-2023		
	Exam Seat No.:		
	Academic Year : 2022-2023	Semester: I	
	Name of Programme : F.Y. B. Tech	Pattern:2022	
	Name of Course: Applied Mathematics - I	Course Code:FYE221001	
	Max. Marks:60	Duration:2.30hrs	

1 This question paper contains 3 pages.

1. Answer to each new question is to be started on a new page.
2. Assume suitable data wherever required, but justify it.
3. Use of non-programmable pocket calculator is allowed.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question

**Que. No.1**

Determine the current in the network given in fig.



**Que. No.2**

2 Reduce the matrix  $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$  to diagonal form, also write Modal matrix and spectral Matrix.

(6) CO1

**Que. No.3**

3.a) If  $u = \tan^{-1} \frac{y}{x}$  then prove that  $u_{xy} = u_{yx}$

(4) CO2

OR

3.b) If  $z^3 - zx - y = 4$  find  $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}$  (4) CO2

3.c) If  $u = \sin\left(\frac{xy}{x^2+y^2}\right) + \sqrt{x^2+y^2} + \frac{x^2y}{x+y}$  find value of  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$  (6) CO3

OR

3.d) If  $u = \log\left[\frac{x^5+y^5}{x^2+y^2}\right]$  then show that (6) CO3

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = -3$$

3.e) If  $z = f(x, y), x = e^u + e^{-v}, y = e^{-u} - e^v$  then Prove that (6) CO3

$$\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y}$$

OR

3.f) If  $u = f(r, s), r = x^2 + y^2, s = x^2 - y^2$  then Prove that (6) CO3

$$y \frac{\partial u}{\partial x} + x \frac{\partial u}{\partial y} = 4xy \frac{\partial u}{\partial r}$$

#### Que. No.4 INDIVIDUAL\_OR

Examine whether following functions are functionally dependent.

4.a) If so, find relation between them, where (5) CO3

$$u = \frac{x+y}{1-xy} \quad v = \tan^{-1} x + \tan^{-1} y$$

OR

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

The area of a triangle ABC is calculated from the formula

4.c)  $\Delta = \frac{1}{2} bc \sin A$ . Errors of 1%, 2%, 3% respectively are made in (5) CO5

measuring b, c & A. If the correct value of A is  $45^\circ$ , find the % error in the calculated value of  $\Delta$ .

OR

4.d) The focal length of mirror is found from  $\frac{2}{f} = \frac{1}{v} - \frac{1}{u}$ . Find the (5) CO5

percentage error in  $f$  if  $u$  and  $v$  are both of error is 2% each.

- 4.e) Discuss the conditions of maxima & minima for the function  $x^2 + y^2 + 3x + 12$ . (6) CO5

OR

- 4.f) Use Lagrange's Method to find Minimum distance from the origin to the plane  $3x + 2y + z = 12$  (6) CO5

**Que. No.5 INDIVIDUAL\_OR**

- 5.a) 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

OR

- 5.b) In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl, if each cricket team of 11 must include exactly 4 bowlers? (5) CO2

- 5.c) From a group of 3 Indian, 4 Pakistani and 5 Americans, a subcommittee of four people is selected by lots. Find the probability that the subcommittee will consist of
- i) two Indian, two Pakistani (5) CO2
  - ii) one Indian, one Pakistani, two American
  - iii) Four American

OR

- 5.d) If A and B are mutually exclusive events,  $P(A) = 0.35$  and  $P(B) = 0.45$ , find
- (a)  $P(A')$
  - (b)  $P(B')$
  - (c)  $P(A \cup B)$
  - (d)  $P(A \cap B)$
  - (e)  $P(A' \cap B')$
- (5) CO2

- 5.e) Three factories produce light bulbs to supply the market. Factory A produces 20%, 50% of the tools are produced in factories B and 30% in factory C. 2% of the bulbs produced in factory A, 1% of the bulbs produced in factory B and 3% of the bulbs produced in factory C are defective. A bulb is selected at random in the market and found to be defective. What is the probability that this bulb was produced by factory B? (6) CO3

OR

- The contents of three Urns are 1 White, 2 Red, 3 Green balls, 2 White, 1 Red, 1 Green ball and 4 White, 5 Red, 3 Green balls. Two balls are drawn from an Urn chosen at random, these are found to be one White and one Green. Find the probability that balls so drawn came from the third Urn.
- 5.f) (6) CO3