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B.Tech. (Sem. - 2nd)

ENGINEERING MATHEMATICS - II

SUBJECT CODE : AM - 102 (2k4 & Onwards)

Paper ID : [A0119]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory.**
2) Attempt any **Five** questions from Section - B and C.
3) Select atleast **Two** questions from Section - B and C.

Section - A

Q1) *(Marks : 2 each)*

a) Define Rank of a matrix. What is the rank of a non singular matrix of order n?

b) Reduce the following differential equation into exact differential equation.
$(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$

c) Solve the equation $\frac{d^4y}{dx^4} + 2\frac{d^2y}{dx^2} + y = 0$.

d) State the condition when the system of non-homogeneous simultaneous linear equations has a unique solution and infinite solutions.

e) Find $div.\vec{F}$ where $\vec{F}$ = grad $(x^3 + y^3 + z^3 - 3xyz)$.

f) State
   (i) Stoke's theorem
   (ii) Gauss divergence theorem.

g) What is Random Variable? Give an example to explain the definition.

h) Define Probability. A and B throw alternately a pair of dice. A wins if he throws 6 before B throws 7 and B wins if he throw 7 before A throws 6. If A begins, find his chance of winning.

i) What is Hermitian matrix give an example?

j) Prove that $\nabla.\nabla \times \vec{F} = 0$.

Section - B

(Marks : 8 each)

Q2) Using Gauss-Jordan method, find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$.

Q3) Determine the rank of the matrix $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$ and hence state whether the row vectors are Linearly independent or Linearly Dependent.

Q4) Solve

(a) $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + y = xe^x \sin x$.

(b) Use method of variation of parameters to solve $\dfrac{d^2y}{dx^2} + 4y = \tan 2x$.

Q5) A particle of mass 'm' executes S.H.M in the line joining the points A and B, on a smooth table and is connected with these points by elastic strings whose tensions in equilibrium are each T. If l, l' be the extensions of the strings beyond their natural lengths, find the time of an oscillation.

Section - C

(Marks : 8 each)

Q6) Show that the following vectors are solenoidal.

(a) $(x+3y)\hat{i} + (y-3z)\hat{j} + (x-2z)\hat{k}$

(b) $\nabla\phi \times \nabla\chi$

Q7) Verify Divergence theorem for $\vec{F} = (x^2 - yz)\hat{i} + (y^2 - zx)\hat{j} + (z^2 - xy)\hat{k}$ taken over the rectangular parallelopiped $0 \le x \le a, 0 \le y \le b, 0 \le z \le c$.

Q8) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution.

Q9) A set of five similar coins is tossed 320 times and the result is

No. of heads	:	0	1	2	3	4	5
Frequency	:	6	27	72	112	71	32

Test the hypothesis that the data follow a binomial distribution.

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