Roll No. ....

Total No. of Questions : 09]

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Paper ID [AM102]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem. - 1st/2nd)

ENGINEERING MATHEMATICS - II (AM - 102) (New)

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

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

Section - A

Q1) *(10 × 2 = 20)*

a) Define rank of a matrix.

b) Write four properties of eigen values.

c) Find solution of the differential equation $y' + y = y^2$.

d) Find complementary solution of $9y''' + 3y'' - 5y' + y = 0$.

e) Find particular integral of $y''' - y'' + 4y' - 4y = \sin 3x$.

f) Find the gradient of the scalar field $f(x, y) = y^2 - 4xy$ at $(1, 2)$.

g) Evaluate $\int_C (x^2 + yz)\,dz$, where C is the curve defined by $x = t$, $y = t^2$, $z = 3t$ for t lying in the interval $1 \le t \le 2$.

h) If A, B, C are mutually exclusive and exhaustive events and $P(B) = 0.6P(A)$ and $P(C) = 0.2P(A)$. Then find $P(A)$.

i) Write four properties of the normal curve.

j) Explain Null Hypothesis.

Section - B

(Marks: 8 Each)

Q2) Show that the matrix A = $\begin{bmatrix} 3 & 1 & -1 \\ -2 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$, is diagonalizable. Hence, find P such that $P^{-1}AP$ is a diagonal matrix. Then obtain the matrix $B = A^2 + 5A + 3I$.

Q3) Solve the initial value problem $e^x(\cos y\, dx - \sin y\, dy) = 0$, $y(0) = 0$.

Q4) Find the general solution of the equation $y'' + 16y = 32 \sec 2x$, using method of variation of parameters.

Q5) A horizontal rod is freely pinned at each end. It carries a uniform load w lb per unit length and has a horizontal pull P. Find the central deflection and the maximum bending moment, taking the origin at one of its end.

Section - C

(Marks: 8 Each)

Q6) (a) Show that $\nabla^2(r^n) = n(n+1)r^{n-2}$.

(b) Show that the vector field $\vec{F} = 2x(y^2 + z^3)\hat{i} + 2x^2 y\hat{j} + 3x^2z^2\hat{k}$ is conservative.

Q7) Evaluate using divergence theorem $\iint_S (\vec{v}.\vec{n})\,dA$, where $\vec{v} = x^2z\hat{i} + y\hat{j} - xz^2\hat{k}$ and S is the boundary of the region bounded by the paraboloid $z = x^2 + y^2$ and the plane $z = 4y$.

Q8) A factory is manufacturing electric bulbs, there is a chance of 1/500 for any bulb to be defective. The bulbs are packed in packets of 50. Calculate the approximate number of packets containing no defective, one, two and three defective bulbs in a consignment of 10,000 packets.

Q9) Two random samples have the following values:

Sample 1	15	22	28	26	18	17	29	21	24
Sample 2	8	12	9	16	15	10			

Test the difference of the estimates of the population variances at 5% level of significance

(Given that $F_{0.05}$ for $v_1 = 8$ and $v_2 = 5$ is 4.82).