

# Paper ID [A0119]

(Please fill this Paper ID in OMR Sheet)

**B.Tech. (Sem. - 1<sup>st</sup>/2<sup>nd</sup>)**

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

**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 at least **Two** questions from Section - B & C.

### Section - A

**Q1)**

**(2 Marks Each)**

- a) Are the solutions  $y_1 = \cos x$  &  $y_2 = \sin x$ , linearly independent.
  - b) Explain Hermitian matrix with suitable example.
  - c) Is the differential eq.  $(y^2 e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$ , exact?
  - d) Find the Particular Integral of  $\frac{d^3 y}{dx^3} + 4 \frac{dy}{dx} = \sin 2x$ .
  - e) Explain the technique of Bernoulli's linear equation.
  - f) If  $\vec{r} = a \sin \omega t + b \cos \omega t$ ; then find  $\vec{r} \times \frac{d\vec{r}}{dt}$ .
  - g) Evaluate  $\text{div} [3x^2 \hat{i} + 5xy^2 \hat{j} + xyz^3 \hat{k}]$  at the point (1, 2, 3).
  - h) From a pack of 52 cards, three cards are drawn at random. Find the chance that they are a king, a queen and a jack.
  - i) A variate X has following probability distribution
 

X	-3	6	9
p(X)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$
- Evaluate  $E(X^2)$ .
- j) Explain confidence limits of sampling.

### Section - B

(8 Marks Each)

**Q2)** Verify Cayley - Hamilton theorem for the matrix  $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ . Find  $A^{-1}$ . Also express  $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$  as a linear polynomial in  $A$ .

**Q3)** Solve  $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$ .

**Q4)** Solve  $y'' - 2y' + y = e^x \log x$ , using method of variation.

**Q5)** A particle is executing simple harmonic motion with amplitude 20 cm and time 4 seconds. Find the time required by the particle in passing between points which are at distances 15 cm and 5 cm from the centre of force and are on the same side of it.

### Section - C

(8 Marks Each)

**Q6)** Find the work done in moving a particle in the force field

$$\vec{F} = 3x^2\hat{i} + (2xy - y)\hat{j} + 3z\hat{k} \text{ along}$$

(a) the straight line from  $(0, 0, 0)$  to  $(2, 1, 3)$ ;

(b) the curve  $x^2 = 4y, 3x^2 = 8z$  from  $x = 0$  to  $x = 2$ .

**Q7)** Evaluate  $\int_C [(x^2 + xy)dx + (x^2 + y^2)dy]$ , where  $C$  is the square formed by the lines  $x = \pm 1, y = \pm 1$ .

**Q8)** A car hire firm has two cars which it hires out day to day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days

(a) on which there is no demand,

(b) on which demand is refused. ( $e^{-1.5} = 0.2231$ ).

**Q9)** Two random samples from two normal populations are given as :

Sample I	16	26	27	23	24	22
Sample II	33	42	35	32	28	31

Do the estimates of population variances differ significantly?

DoF	(5, 5)	(5, 6)	(6, 5)
$F_{5\%}$	5.05	4.39	4.95