Paper ID [A0119]

(Please fill this Paper ID in OMR Sheet)

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

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 eg. $\left(y^2 e^{xy^2} + 4x^3\right)dx + \left(2xye^{xy^2} - 3y^2\right)dy = 0$, exact?

d) Find the Particular Integral of $\dfrac{d^3y}{dx^3} + 4\dfrac{dy}{dx} = \sin 2x$.

e) Explain the technique of Bernoulli's linear equation.

f) If $\vec{r} = a \sin \omega t + b \cos \omega t$; then find $\vec{r} \times \dfrac{d\vec{r}}{dt}$.

g) Evaluate $\mathrm{div}\left[3x^2\hat{i} + 5xy^2\hat{j} + xyz^3\hat{k}\right]$ 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)	⅙	½	⅓

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 $\vec{F} = 3x^2\hat{i} + (2xy - y)\hat{j} + 3\hat{k}$ 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 $\int_C \left[(x^2 + xy)dx + (x^2 + y^2)dy \right]$, 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

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