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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(2007-2010 Batches) (Sem.-2)

ENGINEERING MATHEMATICS-II

Subject Code : AM-102

Paper ID : [A0119]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write briefly :

a) Reduce the matrix

$$A = \begin{bmatrix} 3 & -2 & 1 \\ 2 & -1 & 3 \\ 1 & -2 & 1 \end{bmatrix}$$

to the normal form and find its rank.

b) Solve $xy \frac{dy}{dx} = 1 + x + y + xy$.

c) Solve $\frac{d^2y}{dx^2} + 4y = e^x$.

d) If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, show that $\nabla r^n = nr^{n-2} \vec{r}$

e) If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$, find $\vec{F} \cdot (\text{curl } \vec{F})$.

f) Evaluate the line integral $\int (x^2 + xy)dx + (x^2 + y^2)dy$, where C is the square formed lines $y \pm 1$ & $x \pm 1$.

g) In 800 families with 5 children each, how many families would be expected to have 3 boys and 2 girls?

h) State F-test.

i) Prove that the eigen values of skew hermitian matrix are zero or purely imaginary.

- j) Fit a straight line to the following data considering y as the dependent variable.

x	1.1	2	3	5	6.5
y	0	1	2	3	4

SECTION B

2. (a) Verify Cayley Hamilton theorem for the matrix

$$A = \begin{bmatrix} 3 & 2 & 4 \\ 4 & 3 & 2 \\ 2 & 4 & 3 \end{bmatrix}$$

- (b) Find the inverse of the following matrix by Gauss Jordan method :

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

3. (a) Solve $(2x^2y^2 + y)dx - (x^3y - 3x)dy = 0$.

- (b) Solve the equation : $(px - y)(py + x) = 2p$, where $p = \frac{dy}{dx}$.

4. (a) Use method of variation of parameters to solve the following differential equation :

$$y'' + 4y = \tan 2x$$

- (b) Obtain the complete solution of the differential equation :

$$(1+x)^2 \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 4 \cos[\log(1+x)]$$

5. (a) The differential equation for a circuit in which self inductance and capacitance

neutralize each other is $L \frac{d^2i}{dt^2} + \frac{i}{c} = 0$. Find the current i as a function of t ,

given that T is maximum current and $i = 0$ when $t=0$.

- (b) At the end of three successive seconds, the distances of a point moving with S.H.M. from its mean position measured in the same direction are 1,5,5.

Show that the period of complete oscillation is $\frac{2\pi}{\theta}$, where $\cos \theta = 3/5$.

SECTION C

6. (a) A vector field is given by $\vec{A} = (x^2 + xy^2)\vec{a} + (y^2 + x^2y)\vec{j}$. Show that the field is irrotational and find the scalar potential.

- (b) Evaluate $\iint_S \vec{F} \cdot \hat{n} dS$, where $\vec{F} = yz\hat{i} + zx\hat{j} + xy\hat{k}$ & S is the part of the surface $x^2 + y^2 + z^2 = 1$ which lies in the first octant.

7. (a) Apply Green's theorem to show that the area bounded by a simple closed curve C is given by $\frac{1}{2} \oint_C xdy - ydx$.

Hence, find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

- (b) State divergence theorem and use it to evaluate $\iint_S \vec{F} \cdot \hat{n} dS$ where

$$\vec{F} = ax\hat{i} + by\hat{j} + cz\hat{k} \text{ \& } S \text{ is the surface } x^2 + y^2 + z^2 = 1.$$

8. (a) Derive the mean and variance of Binomial distribution,

- (b) The following mistakes per page were observed in book :

No. of mistakes	0	1	2	3	4	Total
Frequency	211	90	19	5	0	325

Fit a poisson distribution to the data and find the expected frequencies.

9. (a) Two random samples drawn from two normal population have been taken as given below :

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

Examine whether the estimates of population variances differ significantly. Given that: $F_{0.05}$ at (5,5) d.f. = 5.05, $F_{0.05}$ at (5,6) d.f. = 4.39, $F_{0.05}$ at (6,5) d.f. = 4.95.

- (b) A certain drug is claimed to be effective in curing cold. In an experiment on 164 people with colds, half of them were given the drug and half of them sugar pills, the patients reaction's to the treatment are recorded in the following table :

	Helped	Harmed	No effect
Drug	52	10	20
Sugar Pill	44	12	26

Test the hypothesis that the drug is no better than sugar pill for curing colds.