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(Pages : 3)

Reg. No..............................

Name..............................

B.TECH. DEGREE EXAMINATION, MAY 2014

Fourth Semester

ENGINEERING MATHEMATICS—III (CMELRPTANSUF)

(Old Scheme—Supplementary/Mercy Chance—Prior to 2010 admissions)

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*
Each full question carries 20 *marks.*
Use of Statistical tables is permitted.

1. (a) Solve $x^2 \frac{dy}{dx} = 3x^2 - 2xy + 1$. (5 marks)

   (b) Solve $\left(D^3 + 1\right) y = \sin(2x + 3)$. (7 marks)

   (c) Solve $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$. (8 marks)

Or

2. (a) Solve $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = \log x \sin(\log x)$. (8 marks)

   (b) By method of variation of parameters solve $y'' - 2y' + 2y = e^x \tan x$. (7 marks)

   (c) Solve $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$. (5 marks)

3. (a) From the p.d.e. by eliminating the arbitrary function from $z = f(x + it) + g(x - it)$.

   (5 marks)

   (b) Solve $px - qz = z^2 + (x + y)^2$. (7 marks)

   (c) A string is stretched and fastened to two points l apart motion is started by displacing the string in the form $y = a \sin \frac{\pi x}{l}$ from which it is released at time $t = 0$. Show that the displacement of any point at a distance x from one end at time t is given by $y(x,t) = a \sin \frac{\pi x}{l} \cos \frac{\pi c t}{l}$.

   (8 marks)

Or

Turn over

4. (a) A rod of length l with insulated sides is initially at a uniform temperature u_0 its ends are suddenly cooled to 0°C and are kept at that temperature. Find the temperature function $u\,(x,t)$.

(8 marks)

(b) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} - \frac{6\partial^2 z}{\partial y^2} = 0$.

(5 marks)

(c) Solve $\left(p^2 + q^2\right) y = qz$.

(7 marks)

5. (a) Using Fourier sine integral show that :

$$\int_0^\infty \frac{1-\cos \pi\lambda}{\lambda} \sin x\lambda \, d\lambda = \begin{cases} \frac{\pi}{2}, & 0 < x < \pi \\ 0, & x > \pi \end{cases}.$$

(8 marks)

(b) Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, & \text{of } |x| < 1 \\ 0 \quad , & |x| > 1 \end{cases}$ and use it to evaluate

$$\int_0^\infty \frac{x \cos x - \sin u}{x^3} \cos\left(\frac{x}{2}\right) dx .$$

(12 marks)

Or

6. (a) Find the Fourier cosine transform of e^{-x^2}.

(8 marks)

(b) Using Parseval's identity show that $\int_0^\infty \frac{x^2 dx}{\left(1+x^2\right)^2} = \frac{\pi}{4}$.

(12 marks)

7. (a) Out of 800 families with *four* children each how many families would you expect to have

(i) 2 boys and 2 girls.

(ii) Atleast one boy.

(iii) No girl.

(iv) Atleast 2 girls.

Assume equal probabilities for boys and girls.

(10 marks)

(b) Derive the mean and variance of Poisson distribution.

(10 marks)

Or

8. (a) Fit a binomial distribution to the following data :

x :	0	1	2	3	4	5
	2	14	20	34	22	8

(12 marks)

(b) In a normal distribution 31% of the items are under 45 and 8% and over 64. Find the mean and standard deviation of the distribution.

(8 marks)

9. (a) The following figures refer to observations in live independent samples :

Sample I :	25	30	28	34	27	20	13	32	22	38
Sample II :	40.	34	22	20	31	40	30	23	36	17

Analyse whether the samples have been drawn from the populations of equal mean.

(12 marks)

(b) A coin was tossed 400 times and returned heads 216 times. Test the hypothesis that the coin is ubiased.

(8 marks)

Or

10. (a) Two independent samples of sizes 7 and 6 had the following values :

Sample A :	28	30	32	33	31	29	34
Sample B :	29	30	30	24	27	28	

Examine whether the samples have been drawn from normal populations having the same variance.

(12 marks)

(b) A sample of 20 items has been 42 units and S.D. 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units.

(8 marks)

[5 × 20 = 100 marks]