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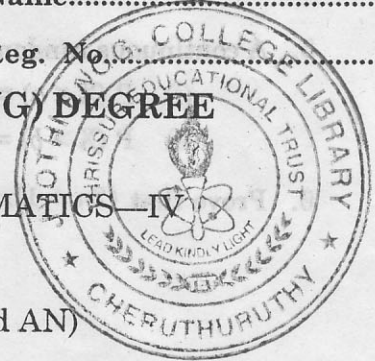
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**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE  
EXAMINATION, JUNE 2011**

EN-09/PT EN 09 401-A—ENGINEERING MATHEMATICS—IV

(2009 Admissions)

(Common for ME, CE, PE, CH, BT, PT AM and AN)



Time : Three Hours

Maximum : 70 Marks

**Part A**

*Answer all questions.*

1. A point is chosen at random from the line segment  $[0, 4]$ . What is the probability that the chosen point  $X$  lies between 1 and 2.
2. Two independent samples of sizes 7 and 6 have variances 4.666 and 5.2. respectively. Examine whether the samples have been drawn from normal populations having the same variance.
3. Show that  $P_n(1) = 1$ .
4. Solve the partial differential equation  $pq = 3$ .
5. Solve  $\frac{\partial^2 z}{\partial y^2} = \sin(xy)$ .

(5 × 2 = 10 marks)

**Part B**

*Answer any four questions.*

1. A manufacturer who produces medicine bottles, finds that 0.1 % of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contain (i) no defective ; (ii) atleast 2 defectives.
2. The mean weight obtained from a random sample of size 100 is 64 gms. The S.D. of the weight distribution of the population is 3 gms. Test the statement that the mean weight of the population is 67 gms at 5 % level of significance. Also set up 99 % confidence limits of the mean weight of the population.
3. Prove that  $\frac{d}{dx} (x^{-n} J_n(x)) = -x^{-n} J_{n+1}(x)$ .
4. Solve the partial differential equation  $z^2(p^2 + q^2 + 1) = c^2$ .

**Turn over**

5. A continuous random variable  $X$  has a p.d.f.  $f(x) = 3x^2$ ,  $0 \leq x \leq 1$ . Find  $a$  and  $b$  such that :

(i)  $P(X \leq a) = P(X > a)$ .

(ii)  $P(X > b) = 0.05$ .

6. Prove that  $(2n+1)x P_n(x) = (n+1)P_{n+1}(x) + nP_{n-1}(x)$ .

(4 × 5 = 20 marks)

### Part C

Answer four questions.

1. In a normal distribution 31 % of the items are under 45 and 7 % are above 68. Find its mean and S.D.

Or

2. (a) Obtain the Poisson distribution as a limiting case of the binomial distribution.

(b) The probability that a man of 40 years of age will be alive 30 years hence is  $\frac{2}{3}$ . Find the probability that out of 5 men aged 40 ; (i) All five men ; (ii) Atleast one man ; (iii) Atmost 3 men will be alive 30 years hence.

3. Two random samples are drawn from 2 normal populations are as follows :

A	:	10	15	18	20	25	23	13	16
B	:	11	14	20	22	24	26	15	

Test whether the samples are drawn from the same normal population.

Or

4. Fit a Poisson distribution to the following data and test the goodness of fit :—

$x$	:	0	1	2	3	4
$f$	:	109	65	22	3	1

5. Prove that  $\int J_3(x) dx = -J_2(x) - \frac{2}{x} J_1(x)$ .

Or

6. Prove that  $\int_{-1}^1 x^m P_n(x) dx = \begin{cases} 0 & \text{if } m \text{ is an integer less than } n \\ \frac{2^{n+1}(n!)^2}{(2n+1)!} & \text{if } m = n \end{cases}$

7. Solve :

(i)  $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$ .

(ii)  $yp = 2xy + \log q$ .

Or

8. Obtain D'Alembert's solution of one dimensional wave equation.

(4 × 10 = 40 marks)