C 15627 (Pages : 2) Name..............................

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

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 $\frac{d}{dx}\left(x^{-n} J_n(x)\right) = -x^{-n} J_{n+1}(x)$.
4. Solve the partial differential equation $z^2\left(p^2 + q^2 + 1\right) = c^2$.

Turn over

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

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

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

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

(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 $2/3$. 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 $\int_{-1}^{1} x^m P_n(x)\, dx = \begin{cases} 0 \text{ if } m \text{ is an integer less than } n \\ \dfrac{2^{n+1}(n!)^2}{(2n+1)!} \text{ if } m = n \end{cases}$

7. Solve :

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

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

Or

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

(4 × 10 = 40 marks)