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Name.....

Reg. No.....



**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
MAY 2012**

EN09 401 A—ENGINEERING MATHEMATICS—IV

(Common for ME/CE/PE/CH/BT/PT/ AM AND AN)

(2009 Admissions)

Time : Three Hours

Maximum : 70 Marks

Part A

Answer all questions.

Each questions carries 2 marks.

1. A bus arrives every 15 minutes at a bus stop. Assuming that the waiting time X for bus is uniformly distributed find the probability that a person has to wait for the bus for more than 10 minutes.
2. The mean operating life of a random sample of 15 bulbs taken from a population with standard deviation 500 hours is 8900 hours. Find a 95% confidence limit for the population mean.

3. Show that $x^4 = \frac{1}{35} [8P_4(x) + 20P_2(x) + 7P_0(x)]$.

4. Solve the partial differential equation :

$$(pq - p - q)(z - px - qy) = pq.$$

5. Form the partial differential equation by eliminating the arbitrary constants from the relation

$$z = (x^2 + a)(y^2 + b).$$

(5 × 2 = 10 marks)

Part B

Answer any four questions.

All questions carry equal marks.

1. In sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2. Out of 1000 such samples how many would be expected to contain :
 - (a) no defectives.
 - (b) exactly 3 defectives.
 - (c) not more than 3 defectives; and
 - (d) atleast 3 defectives.
2. A random sample from 200 villages was taken from Kanpur district and the average population per village was found to be 420 with SD of 50. Another random sample of 200 villages from the same district gave an average population of 480 per village with a SD of 60. Is the difference between the average of the two samples statistically significant ? Take 1% level of significance.

Turn over

3. Write the Bessel's equation. Solve the differential equation $y'' - \frac{2}{x}y' + 4\left(x^2 - \frac{1}{x^2}\right)y = 0$ in terms of Bessel functions.
4. Solve $\frac{dx}{x^2 - y^2 - z^2} = \frac{dy}{2xy} = \frac{dz}{2xz}$.
5. The p.d.f. of a random variable X is given by $P(x) = y_0 e^{-|x|}$, $-\infty < x < \infty$. Find mean and variance.
6. Prove that $P_n(-x) = (-1)^n P_n(x)$.

(4 × 5 = 20 marks)

Part C

*Answer four questions.
Each question carries 10 marks.*

1. At an examination 10% of the students got less than 30 marks and 97% got less than 62 marks. Assuming normal distribution, find μ and σ .

Or

2. (a) Show that the Poisson distribution is the limiting form of Binomial distribution.
(b) If X is a Poisson variate such that $P(X=2) = 9P(X=4) + 90P(X=6)$, find the standard deviation.

3. The nicotine contents in two random samples of tobacco are given below :

Sample I : 21 24 25 26 27

Sample II : 22 27 28 30 31 36

Can you say that the two samples came from the same population.

Or

4. Fit a binomial distribution for the following data and also test the goodness of fit :

x : 0 1 2 3 4

f : 5 29 36 25 5

5. State and prove Rodrigue's formula.

Or

6. Show that $e^{\frac{x}{2}\left(t - \frac{1}{t}\right)} = \sum_{n=-\infty}^{\infty} t^n J_n(x)$.

7. Derive the one-dimensional wave equation.

Or

8. Solve the one-dimensional heat equation by the method of separation of variables.

(4 × 10 = 40 marks)