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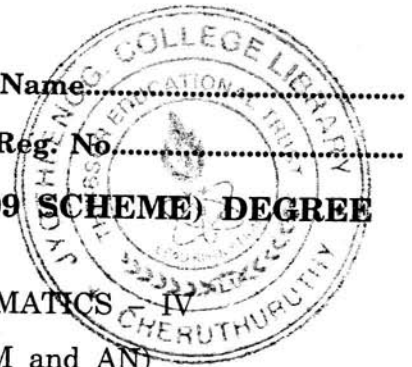
FOURTH SEMESTER B.TECH. (ENGINEERING) (09 SCHEME) DEGREE EXAMINATION, APRIL 2015

EN 09/PTEN 09 401 A—ENGINEERING MATHEMATICS – IV

(Common for ME, MI, 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, 3]. What is the probability that the chosen point X lies between $\frac{1}{2}$ and $\frac{5}{2}$.

2. Two independent samples of sizes 6 and 5 have variances 4.111 and 4.9 respectively. Examine whether the samples have been drawn from normal population having the same variance.

3. Show that $P_n(1) = 1$.

4. Solve the partial differential equation $pq = 2$.

5. Solve the P.D.E. $z = px + qy + \log(pq)$.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

1. Two dice are rolled 100 times. Let X be the number of double sixes. Find the probability that exactly 3 times. We get double six. Using (a) Binomial distribution ; (b) Poisson distribution.

2. Among the 200 employees of a company 120 are post graduates. If 8 of the employees are chosen by a lot, find the probability that (a) 4 of the eight will be post graduates ; (b) majority are non-post graduate employees.

3. Random samples of sizes 500 and 600 are found to have means 11.5 and 10.5 respectively. Can the samples be regarded as samples drawn from the same population whose S.D. is 6.

4. Prove that $J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x$.

5. Express $f(x) = 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials.

6. Solve the P.D.E. $z^2 = 1 + p^2 + q^2$.

(4 × 5 = 20 marks)

Turn over

Part C

Answer any **four** *questions.*

1. In a normal distribution 30% of the items are under 40 and 8% are above 70. Find its mean and S.D.

Or

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

(b) Define the following distributions :

   (i) Hypergeometric distribution.

   (ii) Geometric distribution.

   (iii) Gamma distribution.

3. Prove that $\left(1 - 2xz + z^2\right)^{-1/2} = \sum_{n=0}^{\infty} P_n(x) z^n$.

Or

4. $\dfrac{d}{dx}\left(x^{-\upsilon} J_\upsilon(x)\right) = -x^{-\upsilon} J_{\upsilon+1}(x)$.

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

x:	0	1	2	3	4	5	6	Total
f:	4	19	27	13	6	7	4	80

Or

6. From the following two sample values find out whether they have come from identical normal populations :

   Sample 1 : 21 18 24 28 23 21 17
   Sample 2 : 20 21 19 16 28 27 19 22

7. Derive the one dimensional wave equation.

Or

8. Obtain the solution of the one dimensional heat equation by the method of separation of variables.

$(4 \times 10 = 40$ marks$)$