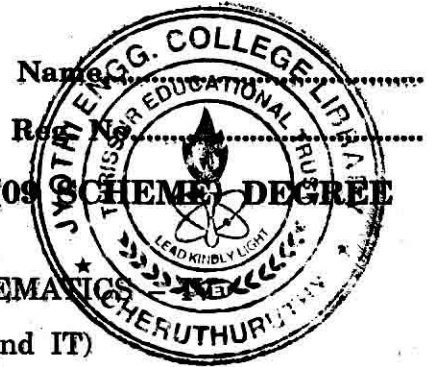


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FOURTH SEMESTER B.TECH. (ENGINEERING) (09 SCHEME) DEGREE EXAMINATION, APRIL 2015

**EN 09/PTEN 09 401 B—ENGINEERING MATHEMATICS
(Common for IC, EC, EE, AI, BM, CS and IT)**

Time : Three Hours

Maximum : 70 Marks

Part A

Answer all questions.

1. Define Gamma distribution.
2. Find the z -transform of $x(n) = \left(\frac{1}{2}\right)^n u(-n)$.
3. Express x^3 in terms of Legendre polynomials.
4. Classify the P.D.E. $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.
5. Solve the P.D.E. $z = px + qy + \sin(pq)$.

(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. X is a uniformly distributed random variable in the interval $(-2, 2)$. Compute :
 - (a) $P(X < 1)$.
 - (b) $P(|X| < \frac{1}{2})$.
 - (c) $P(|X - 1| < 1)$.
 - (d) Find K such that $P(X > K) = \frac{1}{4}$.
3. Using long division, determine the inverse z -transform of $X(z) = \frac{1}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}$,

when (a) ROC $|z| > 1$.

Turn over

4. Using scaling property, determine the z -transform of :

(a) $a^n \cos \omega_0 n$.

(b) $a^n \sin \omega_0 n$.

(c) $2^n u(n-2)$.

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

6. Solve $(z^2 - 2yz - y^2)p + (xy + xz)q = xy - zx$.

(4 × 5 = 20 marks)

Part C

Answer any four questions.

1. The mean yield for one-acre plots is 662 kg with a S.D. of 32 kg. Assuming normal distribution, how many one acre plots in a lot of 1000 plots would you expect to have a yield :

(a) Over 700 kg.

(b) Below 600 kg.

(c) Between 650 and 675 kg.

Or

2. (a) If a balanced die is thrown, find the probability that a '6' first appears on the 7th trial.

(b) 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 (i) 4 of the eight will be post graduates ; (ii) majority are non-post graduate employees.

3. Determine the inverse z -transform of the following $X(z)$ by the partial fraction expansion method :

$$X(z) = \frac{z+2}{2z^2 - 7z + 3} \text{ if the ROC's are :}$$

(a) $|z| > 3$; (b) $|z| < 1/2$; and (c) $1/2 < |z| < 3$.

Or

4. Find the inverse z -transform of :

$$\frac{z^3 - 20z}{(z-2)(x^2 + 4)} \text{ by the residue method.}$$

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

Or

6. Prove that (i) $J_{\nu-1}(x) + J_{\nu+1}(x) = \frac{2\nu}{x} J_{\nu}(x)$; (ii) $J_{\nu-1}(x) - J_{\nu+1}(x) = 2J'_{\nu}(x)$.

7. Solve the following P.D.E.'s :

(a) $p^2 q^2 + x^2 y^2 = x^2 q^2 (x^2 + y^2)$. (b) $zpq = p + q$.

(c) $2(p^2 - q^2) = 3pq$.

Or

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

(4 × 10 = 40 marks)