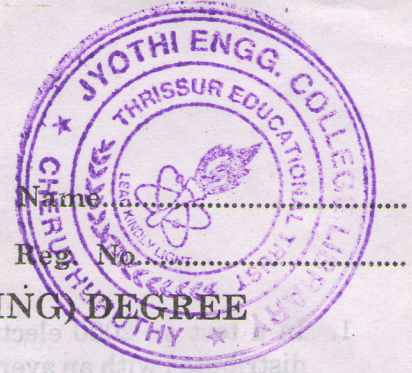C 15628

(Pages : 2)

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

EN 09/PTEN 09 401-B—ENGINEERING MATHEMATICS—IV

(2009 Admissions)

(Common for IC, EC, EE, AI, BM, CS, IT)

Time : Three Hours

Maximum : 70 Marks

Part A

*Answer **all** questions.*

1. Define Gamma distribution.

2. Find the Z-transform of $\dfrac{1}{n}$.

3. Show that $\dfrac{2}{5}\,P_3(x) + \dfrac{3}{5}\,P_1(x) = x^3$.

4. Solve $pq = p + q$.

5. Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$.

(5 × 2 = 10 marks)

Part B

*Answer any **four** questions.*

1. A machine manufacturing screws is known to produce 3 % defective. In a random sample of 10 screws, what is the probability that there are (i) Exactly three defectives ; (ii) Not more than 3 defectives ; (iii) No defectives.

2. In a certain factory turning razor blades there is a small chance of .002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 10,000 packets.

3. Find the inverse Z-transform of $\dfrac{8z^2}{(2z - 1)\,(4z - 1)}$.

4. Solve $f(n + 2) - 3 f(n + 1) + 2 f(n) = 0$; $f(0) = 0$ and $f(1) = 1$. Using Z-transforms.

5. Prove that $\dfrac{d}{dx}\left(x\,J_n(x)\,J_{n+1}(x)\right) = x\left[J_n^2(x) - J_{(n+1)}^2(x)\right]$.

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

(4 × 5 = 20 marks)

Turn over

Part C

Answer all questions.

1. In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for :

   (i) More than 2150 hours.

   (ii) Less than 1950 hours.

   (iii) More than 1920 hours but less than 2160 hours.

   (iv) Not less than 2,000 hours.

Or

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

   (b) Define the following distributions :—

      (i) Hyper geometric distribution.

      (ii) Geometric distribution.

      (iii) Uniform distribution.

3. Find the inverse Z-transform of $\dfrac{z^3 - 20z}{(z - 2)\left(z^2 + 4\right)}$ by Residue method.

Or

4. Find the Z-transform of (i) $\dfrac{1}{n(n + 1)}$; (ii) $e^{3t} \sin 2t$; (iii) $(t + T)\, e^{-(t + T)}$.

5. Prove that $J_{-n}(x) = (-1)^n J_n(x)$.

Or

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

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.

$(4 \times 10 = 40 \text{ marks})$