

C 26868

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Name.....

Reg. No.....

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

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

[Common for IC /EC/ EE/ AI/ BM/CS and IT]

(2009 Admissions)

Time : Three Hours

Maximum : 70 Marks

Answer all questions.

1. Define Hyper Geometric distribution.
2. Find the Z-transform of $\cos\left(\frac{n\pi}{2}\right)$.
3. Express in terms of Legendre polynomial $1 + 2x + x^2$.
4. Solve $z = px + qy + \sin(p + q)$.
5. Find the binomial distribution with mean 4 and variance $\frac{8}{3}$.

(5 × 2 = 10 marks)

Part B

Answer any four questions.

1. If X is a Poisson variable such the $p(X = 2) = 9 p(X = 4) + 90 p(X = 6)$. Find the mean and standard deviation.
2. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is $\frac{5}{6}$. What is the probability that he will knock down fewer than 4 hurdles.
3. Find the Z-transform of $f * g$ where $f(n) = u(n)$, $g(n) = 2^n u(n)$.
4. Prove that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$.

Turn over

5. Solve $\left(\frac{y-z}{yz}\right)p + \left(\frac{z-x}{zx}\right)q = \frac{x-y}{xy}$.

6. Solve $u_{n+2} - 4u_{n+1} + 4u_n = 0$ given $u_0 = 1, u_1 = 0$.

(4 × 5 = 20 marks)

Part C

Answer all questions.

1. Of a large group of men, 5% are under 60 inches in height and 40% are between 60 and 65 inches. Assuming a normal distribution, find the mean height and standard deviation.

Or

2. If X is uniformly distributed random variable with mean 1 and variance $\frac{4}{3}$ find

(a) $p(X < 0)$.

(b) $p(|X| < 1)$

(c) Find k for which $p(X > k) = \frac{1}{3}$.

3. Find the inverse Z-transform of $\frac{z}{z^2 - 2z + 2}$ by residue method.

Or

4. Find the inverse Z-transform of $\frac{z^3 - 20z}{(z-2)^3(z-4)}$ by partial fraction method.

5. Prove that :

(a) $\frac{d}{dx} (x J_n(x) J_{n+1}(x)) = x [J_n^2(x) - J_{n+1}^2(x)]$

(b) $\frac{d}{dx} (J_n^2(x) + J_{n+1}^2(x)) = 2 \left[\frac{n}{2} J_n^2(x) - \frac{n+1}{x} J_{(n+1)}^2(x) \right]$

Or

6. Show that

$$(a) \quad P_{2n}(0) = \frac{(-1)^n (2n)!}{2^{2n} (n!)^2}$$

$$(b) \quad P_{2n+1}(0) = 0$$

7. Solve the following partial differential equations :

$$(a) \quad z = p^2 + q^2$$

$$(b) \quad q(p - \cos x) = \cos y.$$

$$(c) \quad \sqrt{p} + \sqrt{q} = 1.$$

Or

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

(4 × 10 = 40 marks)

