C 26868 (Pages : 3) 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 pdynomial $1 + 2x + x^2$.

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

Turn over

[redacted]

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

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

Or

[redacted]

6. Show that

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

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

7. Solve the following partial differential equations :

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

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

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

Or

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

(4 × 10 = 40 marks)

[redacted]