C 40930   (Pages : 2)   Name.................................
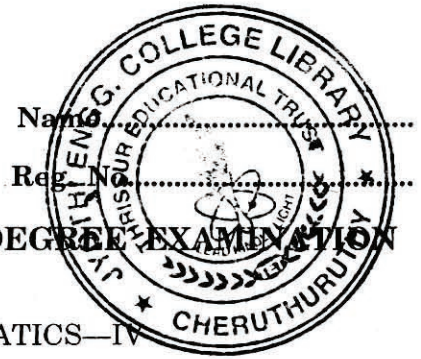
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FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION APRIL 2013

EN 09 401 (A)—ENGINEERING MATHEMATICS—IV

(2009 admissions)

(Regular/Supplementary/Improvement)

[Common for ME, CE, PE, CH, BT, PT, AM and AN]

Time : Three Hours   Maximum : 70 Marks

Part A

Answer all questions.

1. Find the binomial distribution with mean 6 and variance 2.

2. A sample of 50 items taken from a population with S.D. 16 gave a mean 52.5. Find a 95% confidence interval of the population mean.

3. Reduce the differential equation :

$$x \frac{d^2 y}{dx^2} + a \frac{dy}{dx} + k^2 xy = 0 \text{ to Bessel's equation.}$$

4. Solve the partial differential equation :

$$\frac{z}{pq} = \frac{x}{q} + \frac{y}{p} + \sqrt{pq}$$

5. Form the partial differential equation by eliminating the arbitrary constants from $z = a^2 x + b^2 y + ab$.

(5 × 2 = 10 marks)

Part B

Answer any four questions.

1. If the probability of a bad reaction from a certain injection is ·001, determine the chance that out of 2000 individuals more than three will get a bad reaction.

2. Given the following data of two distributions :

	Mean	S.D.	Sample size
A	100	12	80
B	95	10	70

Test whether the difference between the sample mean is significant.

3. Show that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$.

Turn over

4. Show that $P_{2n}(0) = \dfrac{(-1)^n (2n)!}{2^{2n} (n!)^2}$.

5. Solve the partial differential equation :

$$\frac{y-z}{yz} p + \frac{z-x}{zx} q = \frac{x-y}{xy}$$

6. If $f(x) = \begin{cases} ke^{-\alpha^2 x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$

   is the p.d.f. of a random variable X. Find K, E (X) and variance of X.

                                                                        $(4 \times 5 = 20$ marks$)$

Part C

Answer **all** *questions.*

1. In sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 15 is 1. Out of 2000 such samples how many would be expected to contain :

   (a) No defective.   (b) Exactly 3 defectives.

   (c) Not more than 3 defectives.   (d) At least 3 defectives.

                                                        Or

2. In a normal distribution, 5% of the items are under 60 and 40% are between 60 and 65. Find the mean and standard deviation of the distribution.

3. Two random samples drawn from 2 normal populations are as follows :

A :	17	27	18	25	27	29	13	17
B :	16	16	20	27	26	25	21	

   Test whether the samples are drawn from the same normal population.

                                                        Or

4. A sample analysis of examination results of 500 students, it was found that 280 students have failed, 170 have secured a third class, 90 have secured a second class and the rest, a first class. Do these figures support the general belief that above categories are in the ratio 4 : 3 : 2 : 1 respectively.

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

                                                        Or

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

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

                                                        Or

8. Solve (a) $z^2 = 1 + p^2 + q^2$; (b) $q(p - \sin x) = \cos y$.

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