(Pages : 4) **8740**

Reg. No. : ....

Name : ....

Fifth Semester B.Tech. Degree Examination, December 2015
(2008 Scheme)
08.501 : ENGINEERING MATHEMATICS – IV (ERFBH)

Time : 3 Hours Max. Marks : 100

***Instruction :** Answer **all** questions from Part – **A** and **one** full question from **each** Module of Part – **B**.*

PART – A

1. Let $f(x) = \begin{cases} \frac{1}{x^2}, & \text{if } 1 < x < \infty \\ 0, & \text{otherwise} \end{cases}$

   be the p.d.f. of X. Find

   i) P [1 < x < 2} and

   ii) P (4 < x < 5).

2. Find the mean and variance of a Poisson distribution.

3. The no. of weakly breakdowns of a computer follows a Poisson distribution with $\lambda = 0.3$. What is the probability that the computer will operate without a breakdown for three consecutive weeks.

4. In a normal distribution, 10% of the items are under 25 kg weight and 90% of the items are under 70 kg weight. What are the mean and S.D. of the distribution ?

5. Convert the equation $y = ax + \frac{b}{x}$ into linear form and write the normal equations.

6. Define :

   i) Type I error ii) Type II error

   iii) Significance level iv) Critical region.

P.T.O.

7. A random sample of size 16 has 53 as mean. The sum of squares of the deviations from means is 135. Can this sample be regarded as taken from the population having 56 as mean. Obtain 95% confidence limits of the mean of the population.

8. State any two properties of auto correlation function of a random process.

9. S.T. the function $f(x, y) = \begin{cases} \frac{2}{5}(2x+3y), & 0 \le x \le 1, 0 \le y \le 1 \\ 0, & \text{otherwise} \end{cases}$.

is a joint p.d.f. of X and Y.

10. Define

i) W.S.S. process ii) S.S.S process. **(10×4 = 40 Marks)**

PART – B

Module – I

11. a) A continuous random variable has the distribution function defined as

$$F(x) = \begin{cases} 0 & \text{if} \quad x \le 1 \\ K(x-1)^4 & \text{if} \quad 1 \le x \le 3 \\ 1 & \text{if} \quad x > 3 \end{cases}$$

Find

i) k and ii) p.d.f. f(x).

b) A coin was tossed and the experiment was repeated 200 times. The following frequencies of 0, 1, 2, 3, 4, 5 heads were obtained.

No. of heads	0	1	2	3	4	5	Total
Frequencies	12	56	74	39	18	1	200

Fit a binomial distribution to the following data.

c) If X is a Poisson variate such that P (X = 1) = 0.2 and P (X = 2) = 0.2. Find P (X = 0).

OR

12. a) Six unbiased coins are tossed 6400 times. Using the Poisson distribution find the approximate probability of getting six heads x times.

b) The marks of 1000 students in a university are found to be normally distributed with mean 70 and S.D. 5. Estimate the number of students whose marks will be

i) between 60 and 75

ii) more than 75

iii) less than 68.

c) Find the mean and variance of an uniform distribution.

Module – II

13. a) Fit a curve of the form $y = ax + bx^2$ using principal of least squares to the following data.

x	2	4	6	8
y	5.5	4.5	26.2	41.8

b) The average marks in Mathematics of a sample of 100 students was 51 with a S.D. of 6 marks. Could this have been a random sample from a population with average marks 50 ?

OR

14. a) Samples of sizes 10 and 14 were taken from two normal population with S.D. 3.5 and 5.2. The sample means were found to be 20.3 and 18.6. Test whether the means of the two populations are the same at 5% level.

b) If the regression equations between the variables X and Y are $4X - 5Y + 33 = 0$ and $20X - 9Y = 107$, find the correlation coefficient and the means of the variables.

Module – III

15. a) The joint p.d.f. of a bivariate random variable (X, Y) is given by,

$$f(x, y) = \begin{cases} kxy, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find

i) K

ii) P (X + Y < 1)

iii) Are x & y independent random variables ?

b) If $X(t) = \sin(\omega t + y)$, where y is uniformaly distributed in $(0, 2\pi)$. Show that X (t) is wide sense stationery.

c) Derive the mean and variance of a Poisson process.

OR

16. a) Three girls G_1, G_2, G_3 are throwing a ball to each other. G_1 always throws the ball to G_2 and G_2 always throws the ball to G_3, but G_3 is just as likely to throws the ball to G_2 as to G_1. Prove that the process is Markovian. Find the transition probability matrix and classify the states.

b) Determine the mean and variance of the process given that the auto correlation $R_{xx}(\tau) = 25 + \frac{4}{1 + 6\tau^2}$.

c) Discuss the classifications of a Markov process. **(20×3 = 60 Marks)**
