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COLLEGE OF ENGINEERING LIBRARY TRIVANDRUM-15

A – 6366

Reg. No. : ....

Name : ....

C.S/IT **Fifth Semester B.Tech. Degree Examination, September 2016**
(2008 Scheme)
08.501 : ENGINEERING MATHEMATICS – IV (ERFBH)

Time : 3 Hours   Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. The pdf of a continuous random variable X is given by $f(x) = \begin{cases} \lambda e^{-\lambda x}, & x \geq 0 \\ 0 &, x < 0 \end{cases}$.

   Find the probability that :

   i) $X \leq 1$

   ii) $X > 1$.

   Also find the distribution function of X.

2. The probability of error in transmission of a bit over a communication channel is 10^{-4}. What is the probability of more than three errors in transmitting a block of 1000 bits ?

3. Analog signal received at a detector is modeled as a normal random variable with mean 200 microvolts and variance 256 microvolts at a fixed point of time. What is the probability that the signal will exceed 240 microvolts ?

4. If X is uniformly distributed with mean 1 and variance 4/3, find $P[X < 0]$.

5. Two lines of regression are $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$ and variance of x is 12. Find $\bar{x}$, $\bar{y}$, r and σy.

6. In a random sample of 450 industrial accidents it was found that 230 were due to unsafe working conditions. Construct 95% confidence interval for population proportion.

P.T.O.

7. Define the following terms :

   i) Null hypothesis

   ii) Level of significance

   iii) Critical region.

8. The joint pdf of X and Y is given by $f(x, y) = \begin{cases} K(2x+3y) & \theta \le x, y \le 1 \\ 0 & \text{Otherwise} \end{cases}$.

   Find K and the marginal distribution of X.

9. Define Auto correlation, Auto covariance and spectral density.

10. Customers arrive at a ticket counter according to a Poisson process with mean rate of 2 per minute. In an interval of five minutes, find the probability that the number of customers arriving is more than 3 ?

PART – B

Answer **one** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. a) Find the mean and variance of the binomial distribution.

    b) The mileage which car owners get with a certain kind of radial type is a random variable having an exponential distribution with mean 40,000 km. Find the prob. that one of the tyres will last :

       i) atleast 20,000 km

       ii) atmost 30,000 kms.

    c) If X is uniformly distributed in (–3, 3), find P[1X – 2| < 2].

12. a) Out of 800 families with 4 children each, how many families would be expected to have 2 boys and 2 girls, assuming equal probability for boys and girls.

    b) The marks obtained by in a certain subject follows normal distribution with mean 65 and SD 5. If 3 students are selected at random from this group, find the probability that atleast one of them would have scored above 75 ?

c) The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month :

i) Without a breakdown

ii) With only one breakdown.

Module – II

13. a) Find the lines of regression using the following data :

X :	60	61	62	62	63	64	65	67
Y :	61	62	57	61	65	65	61	64

b) The heights of 10 randomly selected students in a school in inches are 50, 52, 52, 53, 55, 56, 57, 58; 58 and 59. Test the hypothesis that mean height of students of the school is 54 inches.

14. a) Convert the equation $y = ax + bx^2$ to linear form and fit the same to the following data :

X :	1	2	3	4	5
Y :	5	7	9	10	11

b) The sales data of an item in six shops before and after a special promotional campaign are as follows :

Before campaign :	53	28	31	48	40	42
After campaign :	58	29	30	55	56	45

Test at 5% level of significance whether the campaign was a success.

Module – III

15. a) Distinguish between SSS and WSS. Give an example for each.

b) If $X(t) = P + Qt$, where P and Q are independent random variables with $E(P) = p$ and $E(Q) = q$, $Var(P) = \sigma_1^2$, $Var(Q) = \sigma_2^2$. Find $E(X(t))$, $R(t_1, t_2)$. Is the process $\{X(t)\}$ stationary in the wide sense.

c) Suppose the probability that a dry day following a rainy day is $\frac{1}{3}$ and the probability that a rainy day following a dry day is $\frac{1}{2}$ given that May 1 is a dry day, what is the probability that May 3rd is a dry day.

16. a) Find the spectral density function of the process with Auto correlation function $R(\tau) = 1 + e^{-\alpha|\tau|}$.

b) If $X(t) = A \sin t + B \cos t$ is a process where A and B are independent random variables with zero mean and equal variance σ^2. Find $E(X(t))$ and $R(t_1, t_2)$.

c) The tpm of a Markov Chain $\{X_n\}$ with states 1, 2, 3 is $P = \begin{bmatrix} 0 & 1/2 & 1/2 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$.

Calculate :

i) $P[X_2 = 1/X_0 = 1]$

ii) $P[X_3 = 2/X_0 = 3]$.

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