(Pages : 4) **6417**

**Reg. No. : ..................................**

**Name : .......................................**

# Fifth Semester B.Tech. Degree Examination, November 2014
## (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 in Part – **B**.*

PART – A **(10×4 = 40 Marks)**

1. If X has the pdf $f(x) = \begin{cases} \frac{K}{4}, & -2 < x < 2 \\ 0, & \text{elsewhere} \end{cases}$ find K and P (2x + 3 > 5).



2. Find the binomial distribution with mean 4 and variance $8/3$.

3. If X is uniformly distributed in $\left[-\frac{5}{4}, \frac{5}{4}\right]$. Find $P\left[X < \frac{1}{2}\right]$.

4. The amount of time that a watch will run without having to be reset is a random variable having an exponential distribution with mean 120 days. Find the probability that such a watch will not have to be reset in atleast 180 days.

5. From the following data, find the correlation coefficient
$\overline{X} = 5.5, \overline{Y} = 4, \sum X^2 = 385, \sum Y^2 = 192, \sum (X+Y)^2 = 947$ and n = 10.

6. The mean of a sample of size 20 from a population with SD 8 was found to be 81.2. Find a 90% confidence interval for the mean.

7. What are the steps in testing a statistical hypothesis ?

P.T.O.

8. If X (t) = A sin ( ωt ) where A and W are constants. Find the auto correlation of $X^2(t)$.

9. Find the mean and variance of the stationary process $R_x(\tau) = 16 + \frac{9}{1+6\tau^2}$.

10. Suppose that X (t) is a Poisson process with E [X (9) ] = 6. Find the mean and variance of X (8). Also find P [X (2) $\leq$ 2].

PART – B

Answer **one full** question from **each** Module.

**Module – I**

11. a) In a lot of 500 solenoids, 25 are defective, find the probabilities of a sample of 20 solenoids chosen at random may have

   i) no defectives

   ii) two defectives

   iii) not more than two defectives.

   b) The average test marks in a particular class is 79 and SD is 5. If the marks are normally distributed, how many students in a class of 200 did not receive marks between 75 and 82.

   c) A random variable X has a uniform distribution over (–2, 2). Compute (i) P [|X| < 1] (ii) P [|X –1| < 1].

OR

12. a) Find the mean and variance of Binomial distribution.

   b) It X is a Poisson variate such that

   P [X = 3] = 3P [X = 4] + 5P [X = 5], find the SD.

   c) At an examination 10% of the students got less than 30 marks and 97% got less than 62 marks. Assuming normal distribution, find $\mu$ and $\sigma$.

## Module – II

13. a) Fit a parabola $y = a + bx + cx^2$ to the following data

| | | | | | | |
|---|---|---|---|---|---|---|
| x : | 0 | 1 | 2 | 3 | 4 | 5 |
| y : | 14 | 18 | 23 | 29 | 36 | 40 |

b) From the following data, find y when x = 45

| | x | y |
|---|---|---|
| **Mean** | 53 | 142 |
| **SD** | 130 | 165 |

and $\sum(x-\overline{x})(y-\overline{y}) = 1220$ and n = 10.

c) A random sample of size 25 drawn from a population having SD 10 is having mean 20. Find 90% confidence interval of the population mean.

OR

14. a) Find the coefficient of correlation from the following data :

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **x :** | 28 | 41 | 40 | 38 | 35 | 33 | 40 | 32 | 36 | 33 |
| **y :** | 23 | 34 | 33 | 34 | 30 | 26 | 28 | 31 | 36 | 38 |

b) Two lines of regression are x + 6y = 6 and 3x + 2y = 10 and variance of x = 12, find $\overline{x}, \overline{y}, \gamma$ and $\sigma_y^2$.

c) Given $n_1 = 50$, $n_2 = 60$, $\overline{X}_1 = 5.3, \overline{X}_2 = 5.82, \sigma_1 = 0.5\ \sigma_2 = 0.6$, test the hypothesis that $\mu_1 = \mu_2$ agaist $\mu_1 > \mu_2$

## Module – III

15. a) The joint distribution of X and Y is given by

| X \ Y | 1 | 2 | 3 |
|---|---|---|---|
| **1** | $1/12$ | 0 | $1/18$ |
| **2** | $1/6$ | $1/9$ | $1/4$ |
| **3** | 0 | $1/5$ | $2/15$ |

Find the marginal and conditional distributions.

b) Show that the process $X(t) = A \sin t + B \cos t$ where A and B are independent variables with zero mean and equal variance, is WSS.

c) The tpm of a Markov chain $\{X_n\}$ having 3 states 0, 1, 2, is

$$P = \begin{bmatrix} 0.75 & 0.25 & 0 \\ 0.25 & 0.50 & 0.25 \\ 0 & 0.75 & 0.25 \end{bmatrix}$$ and the initial distribution is $P(0) = \left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$.

Find $P[X_3 = 2, X_2 = 1, X_1 = 1, X_0 = 2]$.

OR

16. a) Suppose X (t) is a process with $\mu(t) = 3$ and $R(t_1, t_2) = 9 + 4e^{-|t_1 - t_2|/5}$. Find the variance and covariance of X (5) and X (8).

b) If $R(\tau) = 1 + e^{-\alpha|\tau|}$, find the spectral density.

c) The tpm of a Markov chain $\{X_n\}$ having 3 states 1, 2 and 3 is $P = \begin{bmatrix} 0.1 & 0.6 & 0.3 \\ 0.3 & 0.4 & 0.3 \\ 0.2 & 0.2 & 0.6 \end{bmatrix}$

and the initial distribution is $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$. Find $P[X_3 = 2]$.

**(20×3 = 60 Marks)**

______________________