



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 $\frac{8}{3}$.

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

$$\bar{X} = 5.5, \bar{Y} = 4, \sum X^2 = 385, \sum Y^2 = 192, \sum (X + Y)^2 = 947 \text{ and } n = 10.$$

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 ?





8. If $X(t) = A \sin(\omega t)$ where A and ω 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
- no defectives
 - two defectives
 - 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
- $P[|X| < 1]$
 - $P[|X - 1| < 1]$.

OR

12. a) Find the mean and variance of Binomial distribution.
- b) If 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 μ and σ .



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 $\sum (x - \bar{x})(y - \bar{y}) = 1220$ 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 \bar{x} , \bar{y} , γ and σ_y^2 .

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

Module – III

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

Y X	1	2	3
1	$\frac{1}{12}$	0	$\frac{1}{18}$
2	$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{4}$
3	0	$\frac{1}{5}$	$\frac{2}{15}$

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

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

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 $P[X_3 = 2]$.

(20x3 = 60 Marks)