Reg. No. : ....

Name : ....

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D – 4331

Fifth Semester B.Tech. Degree Examination, January 2018
(2008 Scheme)
08.501 : ENGINEERING MATHEMATICS – IV (ERHBF)

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 $f(x) = \frac{x+1}{2}$, for $-1 < x < 1$

   0, otherwise, is the pdf of x. Find the mean and variance.

2. Find the binomial distribution for which mean 4 and variance $\frac{8}{3}$.

3. The amount of time that a watch will run without having to be reset is a random variable having an exponential distribution with mean 90 days. Find the probability that the watch have to be set in less than 24 days.

4. Find the mean and standard deviation of the normal distribution

   $f(x) = ce^{-\frac{1}{24}\left(x^2-6x+4\right)}, -\infty < x < \infty$.

5. Convert the equation $y = ax^3 + bx^2$ to a linear form and write the corresponding normal equations.

6. Find the arithmetic mean and correlation coefficient from the lines of regression $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$.

7. A sample of 50 items taken from a population with standard deviation 16 gave a mean 52.5. Find 90% confidence interval of the population mean.

8. Describe briefly the steps in testing a statistical hypothesis.

9. The joint density of X and Y is given by

$f(x, y) = c(6 - x - y),\ 0 < x < 2,\ 2 < y < 4$

$0,$ elsewhere. Find c and $P(X < 1, Y < 3)$.

10. Find the mean and variance of the stationary process with no periodic components and $R(\tau) = 16 + \frac{9}{1 + 6\tau^2}$.

PART – B

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

Module – I

11. a) If $f(x) = \frac{c}{x^2 + 1}, -\infty < x < \infty$ is a pdf, find c and the distribution function F(x). **6**

b) Six dice are thrown 729 times. How many times do you expect atleast 3 dice to show 5 or 6 ? **7**

c) In a normal distribution 31% of the items are under 45 and 8% are above 64. Find its mean and standard deviation. **7**

OR

12. a) If X has a uniform distribution in (–k, k), k > 0 find k such that $P[|x| < 1] = P[|x| > 1]$. **6**

b) If X is a normal variable with mean 30 and standard deviation 5. Find $P(26 \leq X \leq 40)$ and $P(X \geq 45)$. **7**

c) The number of accidents in a year to taxi drivers in a city follows a Poisson distribution with mean 3. Out of 2000 taxi drivers find the number of drivers with **7**

i) no. of accidents in a year and

ii) more than 3 accidents in a year.

Module – II

13. a) Fit a parabola of the form $y = a + bx + cx^2$ to the following data : **10**

X :	1941	1951	1961	1971	1981
Y :	8	10	12	10	16

Also find y when x = 1976.

b) Compute the correlation coefficient from the following data : **10**

x :	77	54	27	52	14	35	20	25
y :	35	58	60	40	50	40	35	56

Also find y when x = 24.

OR

14. a) Calculate the regression lines from the following data : **10**

x :	33	56	50	65	44	38	44	50	15	26
y :	50	35	70	25	35	58	75	60	55	26

b) In sample of 300 units of a manufactured product, 65 units were found to be defective and in another sample of 200 units there were 35 defectives. Is there significant difference in the proportion of defectives in the sample at 5% level of significance ? **10**

Module – III

15. a) The joint pdf of X and Y are given by $f(x, y) = c(x + 2y)$ where x = 0, 1, 2 and y = 0, 1, 2, 3. **7**

i) Find c.

ii) Find $P(x \leq 1)$ and $P(x + y \leq 3)$

b) If $X(t) = A + Bt$ where A and B are independent random variables with $E(A) = p$, $E(B) = q$, $Var(x) = \sigma_A^2$ and $Var(B) = \sigma_B^2$, find $R(t_1, t_2)$ and $C(t_1, t_2)$. **7**

c) The tpm of a markov chain $\{X_n\}$ have 3 states 1, 2 and 3 is $P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0.3 & 0.4 & 0.3 \end{bmatrix}$

and the initial distribution is $P(0) = (0.7, 0.2, 0.1)$

Find : **6**

i) $P(X_3 = 2, X_2 = 3, X_1 = 3, X_0 = 2)$ and

ii) $P(X_2 = 3)$

OR

16. a) If $f(x, y) = \begin{cases} ke^{-(2x+y)}, & x \geq 0, y \geq 0 \\ 0, & \text{otherwise} \end{cases}$ is a joint pdf find :

i) k

ii) marginal pdf's of x and y. **7**

b) If $X(t) = r\cos(\omega t + \phi)$ where the random variables r and ϕ are independent and ϕ is uniform in $(-\pi, \pi)$. Find $R(t_1, t_2)$. **7**

c) Find the power spectrum if $R(\tau) = e^{-\alpha\tau}\cos\beta\tau$. **6**
