

B.E. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-IV
SE201 - Mathematics-III (Probability and Statistics)

P. Pages : 3

Time : Three Hours



GUG/W/23/13856

Max. Marks : 80

- Notes : 1. All questions carry equal marks.
2. Use of non programmable calculator is permitted.

1. a) In binary communication channel A is the input and B is the output. Find $P(A/B)$ and $P(A/B')$ if $P(A) = 0.4$ $P(B/A) = 0.9$ and $P(B'/A') = 0.6$ 8

- b) A random variable X has the following probability function. 8

| | | | | | | | | |
|----------|---|---|----|----|----|-------|--------|------------|
| X = x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P(X = x) | 0 | K | 2K | 2K | 3K | K^2 | $2K^2$ | $7K^2 + K$ |

Find:

- i) The constant K
iii) $P(x < 6), P(X \geq 6)$
iii) $P(1.5X < 4.5 / X > 2)$

OR

2. a) The joint probability function of two discrete random variable X and Y is given by 8

$$F(x, y) = \begin{cases} c(2x + y) & 0 \leq x \leq 2, 0 \leq y \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

Find:

- i) The constant c
ii) $E(x) E(y)$
iii) $\text{Var}(x)$ and $\text{Var}(y)$
iv) $\text{Cov}(X, Y)$ and P.

- b) On an average two emergency causes are received in week (7 days) period at a hospital. Determine the probability that there are: 8
i) There an less emergency causes in 2 weeks period.
ii) Exactly eight emergency causes in 3 weeks period.

3. a) A random variable X has density function. 8

$$F(x) = \begin{cases} Kx & 0 < x < 5 \\ K(10 - x) & 5 < x < 10 \\ 0 & \text{otherwise} \end{cases}$$

Find:

- i) The constant K
ii) $P(2.5 < x < 7.5)$

- b) Assume that the diameter of 1000 brass plugs taken consecutively from a machine from a normal distribution with mean 0.7515 inches and standard deviation 0.0020 inches. How many of the plugs are likely to be rejected if the diameter is to be 0.752 ± 0.004 inches? 8

OR

4. a) The chance that a doctor A will diagnose a disease X correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A who had disease X died. What is the chance that his disease was diagnosed correctly. 8
- b) In a certain city, the daily consumption of water (in millions of liters) follows approximately a gamma distribution with $\alpha = 2$ and $\beta = 3$. If the daily capacity of the city is 9 million liters of water. What is the probability that on any given day the water supply is inadequate. 8
5. a) Find the coefficients of 8
- i) Skewness
- ii) Kurtosis for the distribution with density function.
- $$f(x) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0 \\ 0 & x < 0 \end{cases}$$
- b) Find the probability of getting a total of 7 8
- i) At least once
- ii) At the most twice in the five tosses of a pair of fair dice.

OR

6. a) Find the equation of the lines of regression and the coefficients of correlation for the following data. 8
- | | | | | | | |
|---|----|----|----|---|---|----|
| x | 2 | 4 | 5 | 6 | 8 | 11 |
| y | 18 | 12 | 10 | 8 | 7 | 5 |
- b) Obtain the rank correlation coefficients for the following data. 8
- | | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|----|----|
| x | 68 | 64 | 75 | 50 | 64 | 80 | 75 | 40 | 55 | 64 |
| y | 62 | 58 | 68 | 45 | 81 | 60 | 68 | 48 | 50 | 70 |
7. a) Fit a straight line to the following data. 8
- | | | | | | |
|---|-------|-------|-------|-------|-------|
| x | 1.53 | 1.78 | 2.60 | 2.95 | 3.42 |
| y | 33.50 | 36.30 | 40.00 | 45.85 | 53.40 |
- b) Fit a curve $y = ab^x$ to the following data. 8
- | | | | | | |
|---|-----|-------|-------|-------|-------|
| x | 2 | 3 | 4 | 5 | 6 |
| y | 144 | 172.3 | 207.4 | 248.8 | 298.5 |

OR

8. a) Fit a least square parabola $y = a_0 + a_1x + a_2x^2$ for the data. 8
- | | | | | | | |
|---|---|---|---|---|----|----|
| x | 3 | 5 | 7 | 9 | 11 | 13 |
| y | 2 | 3 | 4 | 6 | 5 | 8 |

- b) Fit the curve $y = ax^b$ to the following data by least square. 8

| | | | | | | |
|---|------|------|------|------|------|------|
| x | 1 | 2 | 3 | 4 | 5 | 6 |
| y | 2.98 | 4.26 | 5.21 | 6.10 | 6.80 | 7.50 |

9. a) Same as before but this time jokers are included and you counted 1662 cards with these results. 8
- Spades 404
 Hearts 420
 Diamonds 400
 Clubs 356
 Jokers 82
- i) How many jokers would. You expect out of 1662 random cards. How many of each suit?
 ii) Is it possible that the cards are really random? Or one the discrepancies too large.
- b) An examinations was given in two classes consisting of 40 and 50 students respectively. In the first class the mean grade was 74 with a standard deviation of 7. If these a significant difference between the performance of the two classes at a level of significance of (a) 0.05 (b) 0.01? (c) What is the P value of the test? 8

OR

10. a) In 200 tosses of a coin 115 heads and 85 tails were observed. Test the hypothesis that the coin is fair using a level of significance of (a) 0.05 (b) 0.01 (c) find the P value of the test. 8
- b) A coin that is tossed 6 times comes up heads 6 times. Can we conclude at (a) 0.05 (b) 0.01 significance level that the coin is not fair? Consider both a one tailed and a two tailed test. 8
