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

———

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

1. a) A box contains 8 tickets bearing the following numbers (1, 2, 3, 4, 5, 6, 8, 10). Two tickets **8**
are drawn at random. Find the probability that both the sides show even numbers when
i) The first ticket is kept aside.
ii) The first ticket drawn is replaced in the box.

b) From a lot of 10 items containing 3 defective, a sample space of 4 items is drawn at random. **8**
Let the random variable x denote the number of defective items in the sample. Find the
probability distribution of X & P (X > 1).

OR

2. a) The joint probability distribution of X & Y is given by **8**

X \ Y	0	1
-1	$\frac{1}{8}$	$\frac{2}{8}$
+1	$\frac{3}{8}$	$\frac{2}{8}$

Find:
i) Var (2X – 3Y)   ii) E (2X – 3Y)
iii) Cov (X, Y)   iv) Coefficient of correlation between X & Y

b) The average rate of phone calls received is 0.7 calls per minute at an office. Determine **8**
probability that
i) There will be at least one calls in a minute.
ii) There will be at least three calls during 5 minutes.

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

$$F(x) = \begin{cases} cx^2, & 1 \le x \le 2 \\ cx, & 2 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$

Find:
i) The constant C.   ii) P (X > 2)
iii) $P\left(\frac{1}{2} < X < \frac{3}{2}\right)$ iv) The distribution function of X

b) An Aptitude test for selecting engineers in an industry is conducted on 100 candidates. The average score is 42 & standard deviation of score is 24. Assuming normal distribution for the scores, find: **8**
   i) The number of candidates whose score is more than 60.
   ii) The number of candidates whose score lie between 30 & 60.

OR

4. a) Assume we have two identical urns. Urn A contains 5 red & 3 black balls while urn B contains 4 red & 5 black balls. An urn is chosen at random & then a ball is selected at random from this urn. What is the probability that the ball is black? **8**

   b) The lifetime X (in months) of a computer has a gamma distribution with mean 24 months & standard deviation 12 months. Find the probability that the computer will **8**
   i) last between 12 & 24 months
   ii) last at most 24 months.

5. a) If X is a random variable having density function **8**

$$F(x) = \begin{cases} c\left(1 - \dfrac{|x|}{a}\right), & |x| \le a \\ 0, & \text{otherwise} \end{cases}$$

Find the coefficient of skewness & kurtosis.

   b) Find the probability of setting a total of 7 (i) At least once (ii) At the most twice in the five tosses of a pair of fair dice. **8**

OR

6. a) Calculate Karl Pearson's coefficient of correlation & the equation of the lines of regression for the following data. **8**

X	18	19	20	21	22	23	24	25	26	27
Y	17	17	18	18	18	19	19	20	21	22

   b) Marks of twelve students in mathematics paper I & paper – II are given below. **8**

Paper-I	60	34	40	50	45	40	22	43	42	66	64	46
Paper-II	75	32	33	40	45	33	12	30	34	72	41	57

Calculate Rank correlation coefficient.

7. a) Find the relation of the type R = aV + b when some values of R & V obtained from an experiment are **8**

V	60	65	70	75	80	85	90
R	109	114	118	123	127	130	133

   b) Fit the curve $y = ae^{bx}$ to the following data **8**

X	0	2	4
Y	5.012	10	31.62

OR

8. a) Fit a curve $y = ax + bx^2$ for the following data. **8**

X	1	2	3	4	5	6
Y	2.51	5.82	9.93	14.84	20.55	27.06

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

X	1	2	3	4	5	6
Y	2.98	4.26	5.21	6.10	6.80	7.50

9. a) In the garden pea, yellow cotyledon color is dominant to green & inflated pod shape is dominant to the constricted form considering both of these traits jointly in self – fertilized dihybrids, the progeny appeared in the following numbers. 193 green inflated, 184 yellow constricted 556 yellow inflated, 61 green constricted. Do these genes assort independently? Support your answer using chi-square analysis. **8**

b) Two groups A & B each consist of 100 people who have a disease. A serum is given to group A but not to group B otherwise the two groups are treated identically. It is found that in groups A & B, 75 & 65 people respectively. Recover from the disease. Test the hypothesis that the serum helps to care the disease using a level of significance of (a) 0.01 (b) 0.05 (c) 0.10 (d) Find the P value of the test. **8**

OR

10. a) In 200 tosses of a coin, 115 heads & 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 survey of 320 families with 5 children each revealed the distribution of boys & girl shown in table. **8**

No. of boys	5	4	3	2	1	0
No. of girls	0	1	2	3	4	5

    a) Is the result consistent with the hypothesis that male & female birth are equally probable.

    b) What is the p value of the sample result.

****