M.C.A [SEM – II]
Probability and Statistics
(DEC- 2017)

Q.P. Code :09922

[Time: 3 Hours] **[Marks:100]**

Please check whether you have got the right question paper.

N.B:
1) Question No. 1 is compulsory.
2) Attempt any four questions out of remaining six questions.
3) Assume necessary data but justify the same.
4) Figures to the right indicate full marks.
5) Use of scientific calculator is allowed.

1. a) i) What is the probability that 4 S's come consecutively in the arrangement of the letters in the word `MISSISSIPPI'. **[05]**

ii) Using usual notations find the harmonic mean of Beta Distribution of second kind. **[05]**

b) i) Find the Karl Pearson's coefficient of correlation for the data **[05]**

X	2	3	4	5	6
y	3	4	4	6	8

ii) Suppose a random variable ,X, takes on the values -3,-1,2 and 5 with probabilities $\frac{2k-3}{10}, \frac{k-2}{10}, \frac{k-1}{10}, \frac{k+1}{10}$ **[05]**
Determine the distribution (CDF) and the expected value of x.

2. a) The joint probability density function of two dimensional random variable $(X, Y) is$ given by **[10]**
$f(x,y)=1-e^{-x}-e^{-y}+e^{-(x+y)}, x \geq 0, \geq 0$
$f(x, y) = 0$; elsewhere
i) Find marginal density functions of X and Y.
ii) Find $P(X+Y \leq 1)$

b) The mean and S.D. of a group of 100 items were 40 and 10 respectively. It was later found that two value were wrongly recorded as 30 and 72 instead of 3 and 27. Find the corrected mean and S.D. **[05]**

c) If X is the Poisson variate such that **[05]**
$P(X=2) = 9P(X=4) + 90P(X=6)$
Find the value λ and X.

3. a) i) State and Prove Bayes Theorem. **[05]**

ii) In a sample of 1000 cases the mean of certain test is14 and S.D. is 2.5. Assuming the distribution to be normal find **[05]**
1) How many students score between 12 and 15?
2) How many scored above 15?
{Given
$P(0 \leq z \leq 4) = 0.1554$
$P(0 \leq z \leq 0.8) = 0.2881$
$P(0 \leq z \leq 1.6) = 0.4452$}

3. **b)** i) The diameter of an electric cable say X, is assumed to be a continuous random variable with p.d.f **[05]**
$f(x)=6x(1-x), 0<x<1$
Determine a number 'b' such that $P(X<b)=P(X>b)$

ii) The following data gives the number of radio sets sold by showroom during 10 days: **[05]**
12,17,20,16,13,11,18,12,18,13 find the coefficient of variation.

4. **a)** i) Find the Spearman's rank correlation coefficient for the following data. **[05]**

Marks in DS	63	70	45	59	75	59	35	70	59	50
Marks in CG	57	63	40	53	55	76	43	63	65	45

ii) The following table gives the number of runs scored by a player during 10 test matches. Find whether the numbers of runs are uniformly distributed over the matches. **[05]**

Test match	1	2	3	4	5	6	7	8	9	10
Runs scored	8	8	10	9	12	8	10	14	10	11

(Given for 9 degrees of freedom at 5% level of significance, the table value of χ^2 is 16.9)

b) i) For (M/M/1): (FCFS/∞ /∞) queuing model, the mean arrival rate (λ) and mean service rate (μ) are constant. Assuming expression for steady state probability of exactly 'n' customers in the style as **[05]**

$P_n = \left(\frac{\lambda}{\mu}\right)^n \left(1-\frac{\lambda}{\mu}\right)$ obtain the expression for expected number of customers in the system.

ii) A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find average number of customers in the system the average time a customer spends in the system. **[05]**

5. **a)** i) An attempt was made to check whether there is any effect on marks after listening to music. Students were given similar test papers before and after listening to music. Following numbers indicate the changes in marks of 12 students after listening to music. 5,2,8,-1,3,0,6,-2,1,5,0,4 **[05]**
Can it be concluded that listening to music will be in general accompanied by an increase in marks.
(Given: The value of t_α at 5% level of significance for 11 degrees of freedom is 2.201)

ii) Show that Geometric distribution is memoryless. **[05]**

5. b) i) Calculate Bowley's Coefficient of skewness from following data. **[05]**

Values	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	6	8	17	21	15	11	2

ii) A random variable X has following probability distribution function **[05]**

$$F(x) = \begin{cases} ke^{-2x}, x \geq 0 \\ 0, \ otherwise \end{cases}$$

Find k and median of the distribution.

6. a) i) A consignment of 15 record players contains 4 defective. The record players are selected at random, one by one, and examined. Those examined are not put back. What is the probability that the 9th one examined is the last defective? **[05]**

ii) A problem in Statistics is given to three students A, B and C whose chances of solving it are 1/2, 3/4 and 1/4 respectively. What is the probability that the problem will be solved if all of them try independently? **[05]**

b) i) Consider discrete random variables X and Y with the joint pmfs as below. Are X and Y are un-correlated? Justify. **[05]**

Y→ X↓	-1	0	1
-2	1/16	1/16	1/16
-1	1/8	1/16	1/8
1	1/8	1/16	1/8

ii) X and Y are independent variables with mean 10 and 20, and variances 2 and 3 respectively. Find the variance of 3X+4Y. **[05]**

7. a) i) Find the mean deviation about the arithmetic mean of the following data. **[05]**

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	5	7	11	22	11	7	5

ii) Ram plays 12 games of chess with computer and he wins 6 games while compute wins 4 games and 2 games end in tie. Ram again decides to play 3 more games. Find the probability that two games end in tie. Also find the probability that computer wins at least one game. **[05]**

b) i) A coin is tossed till tail appears. What is the expectation of number of tosses required? **[05]**

ii) Calculate Modal marks for the following. **[05]**

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Total no of students	5	10	14	19	17	15	5
