



PJ – 581

III Semester M.C.A. Examination, January 2019
(CBCS Scheme)
COMPUTER SCIENCE
MCA 304 : Statistical Analysis

Time : 3 Hours

Max. Marks : 70

Instruction : Answer *all* Sections.

SECTION – A

Answer **any 5** questions. **Each** question carries 6 marks. (5×6=30)

1. State and prove addition theorem of probability for three events. 6

2. Find the variance of the following distribution using mathematical expectation. 6

x	0	1	2	3	4	5
p(x)	0.05	0.1	0.2	0.4	0.15	0.1

3. State and prove Baye's Theorem. 6

4. Fit a Poisson distribution for the data given below. 6

x	0	1	2	3	4	5
f	156	16	5	2	1	0

5. Fit a curve of the form $y = ab^x$ for the following data. 6

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.6

6. Find the coefficient of correlation between x and y for the following data. 6

x	1	2	3	4	5	6	7
y	10	11	12	14	13	15	16

P.T.O.



7. There are two candidates A and B contesting an election. A pre-election survey of 80 men and 120 women gave the following results. 6

	Voted A	Voted B	Total
Men	27	53	80
Women	64	56	120

Apply Chi-square test to see whether voting pattern is the same among men and women.

8. Apply the method of semi-averages for determining trend of the following data and estimate the value for 1992 and 1999. 6

Years	1993	1994	1995	1996	1997	1998
Sales	20	24	22	30	28	32

SECTION - B

Answer any 4 questions. Each question carries 10 marks. (4×10=40)

9. a) Define the following terms and give examples for the same.

- i) Sample space
- ii) Independent events.

- b) A box contains 500 IC chips of which 100 are manufactured by company X and the rest by company Y. It is estimated that 10% of the chips made by company X and 5% made by company Y are defective. If a randomly selected chip is found to be defective, find the probability that it came from company X. 6

10. For the following joint probability distribution.

X \ Y	1	2	3	4	5	6
0	0	0	0.0312	0.0625	0.0625	0.0938
1	0.0625	0.0625	0.125	0.125	0.125	0.125
2	0.0312	0.0312	0.0157	0.0157	0	0.0312



Find :

- i) Marginal distributions of X and Y.
- ii) $E(X)$ and $E(Y)$.
- iii) $V(X)$ and $V(Y)$.
- iv) Conditional distribution of X when $Y < 2$.
- v) Conditional distribution of Y when $X = 1$.

10

11. From the following data, fit two regression lines.

x	1	2	3	4	5	6	7
y	2	4	7	6	5	6	5

- i) Predict x when $y = 8$.
- ii) Predict y when $x = 8$.
- iii) Compute the correlation coefficient.

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12. a) Compute the rank correlation coefficient for the following data.

6

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

- b) With an illustration each explain simple random sampling and stratified sampling.

4

13. a) The weights of hearts of 5 female cats and 8 male cats are given below.

Female cats :	7.5	7.3	7.1	9.0	7.6			
Male cats :	12.7	15.6	9.1	12.8	8.3	11.2	9.4	8.2

Test at 1% level of significance that mean weight of hearts of male cats is more than that of female cats.

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- b) Explain the components of time series.

5



14. For the following data representing the number of units of production per day turnedout by five workers using four machines.

Test for the significant difference between the workers and between the machine types.

Worker	Machine Type			
	A	B	C	D
I	4	2	7	4
II	6	0	12	3
III	6	4	4	8
IV	3	2	6	7
V	2	2	9	1

(Use $\alpha = 5\%$).

10



III Semester M.C.A. Examination, January/February 2018
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Instruction : Answer any five questions from Part – A and any four from Part – B.

PART – A

Answer any five questions. (5×6=30)

- a) Anu can solve 40% of the problem given in placement test, Manu can solve 30% of the problem. If a randomly selected problem is given then, what is the probability that it is solved? **3**
- b) If A and B are independent then Prove that \bar{A} and \bar{B} are also independent. **3**
2. State and prove Baye's theorem of probability.
3. Derive mean and variance of binomial distribution.
4. Calculate the coefficient of correlation from the following data and comment on the value obtained.

Statistics (X)	30	60	30	66	72	24	18	12	42	06
Accountancy (Y)	06	36	12	48	30	06	24	36	30	12

5. Fit a least curve of the form $y = ab^x$ to the following data :

x	1	2	3	4	5	6	7	8
y	1	1.2	1.8	2.5	3.6	4.7	6.6	9.1

6. Define simple random sampling and stratified random sampling with example.
7. The probability a tanker being destroyed on a war field is 0.02. The company owns 6 tankers. Find the probability of (i) losing one tanker (ii) losing at most 2 tankers (iii) losing none, in a war.

P.T.O.



8. Using the method of semi-average determine the trend of the following data :

Year	1990	1991	1992	1993	1994	1995	1996	1997
Production in '000' tonnes	16	14	20	18	12	23	28	25

PART – B

Answer any four questions.

(4×10=40)

9. a) Verify the function $f(x) = \begin{cases} 6x(1-x) & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$ is a p.d.f. or not. 4
- b) For the following bivariate distribution, find the marginal distribution of X and Y, E(X), E(Y), V(X) and V(Y). 6
10. The following data relate to the ages of husbands and wives :

Age of Husbands	25	28	30	32	35	36	38	39	42	55
Wives	20	26	29	30	25	18	26	35	35	46

Obtain the two regression equations and determine the most likely age of husband for the age of wife 25 years. Also obtain the coefficient of correlation.

11. a) In a marriage function 2000 photos were clicked by P_1 , 55 of them are defective. P_2 clicked 5000 photos out of which 30 are defective. P_3 clicked 3000 photos and 40 of them are defective. If a photograph is chosen randomly and found to be defective, what is the probability it is clicked by P_2 ? 5
- b) A random sample of 1000 workers from garment factory 'A' shows that their mean wages are ₹ 47/week with S.D. of ₹ 28. A random sample of 1500 workers from Factory 'B' gives a mean wage of ₹ 49/week with S.D. of ₹ 40. Is their any significant difference between their mean level of wages (Test ' α ' at 5%) 5
12. a) Height of girls is normally distributed with mean 165 cms and standard deviation 5 cms. Find the probability that height of a girl is (i) more than 177 cms (ii) less than 162 cms. 5
- b) On an average a school kid makes 3 mistakes in one page of notes. Using Poisson's distribution find the probability that a randomly observed page is free of mistakes. Among 200 pages, in how many pages would you expect mistakes ? 5



- 13. a) Fit a straight line trend by the method of least squares, tabulate the trend values and show the values on a graph from the following figures of production of Rice mill. 8
- b) Name the components of time series. 2
- 14. Each of the following set of observations is a random sample from a normal population. On the basis of the given data test whether the mean populations are equal or not. (Test $\alpha = 5\%$).

Set 1	249	242	247	250	252		
Set 2	231	256	255	258			
Set 3	266	261	265	264			
Set 4	262	260	263	262	261	264	262

9) b)

XY	5	10
0	0.1	0.2
1	0.2	0.4
2	0.1	0

13) a)

Year	1981	1982	1983	1984	1985	1986	1987
Production '000' tones	80	90	92	83	94	99	92



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Instruction : Answer **any five** questions from Part – A and **any four** questions from Part – B.

PART – A

Answer **any five** questions : **(5×6=30)**

1. a) Define Sample Space, Mutually Exclusive Events and Independent Events. **3**
b) State axiomatic approach to probability. **3**

2. A random variable X has the following probability distribution :

X : 1 2 3 4

P(x) : 5k 4k 3k² 7k²

Find the value of k, mean and variance.

3. a) State and prove Baye's theorem. **4**

b) If $f(x) = \begin{cases} (x+1)/2, & -1 < x < 1 \\ 0 & \text{elsewhere} \end{cases}$

represents the probability density function of random variable X, find E(X). **2**

4. a) The following are the marks of 8 students in Maths and Statistics. Find the coefficient of rank correlation. **4**

Marks in Maths : 25 43 27 35 54 61 37 45

Marks in Stats. : 35 47 20 37 63 54 28 40

- b) In a bivariate data, the regression lines are $2X - Y + 4 = 0$ and $X - Y + 1 = 0$. Find correlation coefficient. **2**

P.T.O.



5. 12% of the items produced by a machine are defective. What is the probability that out a random sample of 5 items produced by the machine ?
- All are defectives
 - At least one is defective
 - At most two are defectives.
6. A potential buyer of electric bulbs bought 50 bulbs of brand A and B. Upon testing these bulbs, it was found that brand A had a mean life of 1282 hours with a standard deviation of 80 hours, whereas brand B had a mean life of 1208 hours with a standard deviation of 94 hours. Can the buyer be reasonably certain that the two brands do not significantly differ in quality ?
7. Fit an equation of the type $Y = ab^x$ to the following data :
- | | | | | | |
|-----|-----|-----|------|------|-----|
| X : | 1 | 2 | 3 | 4 | 5 |
| Y : | 1.6 | 4.5 | 13.8 | 40.2 | 125 |
8. Find the trend for the following time series using three-yearly moving average method :
- | | | | | | | | | |
|---------|------|------|------|------|------|------|------|------|
| Year : | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Value : | 2 | 4 | 5 | 7 | 8 | 10 | 13 | 15 |

PART - B

Answer **any four** questions :**(4×10=40)**

9. The joint probability distribution of X and Y is given in the following table :

X/Y	1	2	3
1	5/27	4/27	2/27
2	1/27	3/27	3/27
3	3/27	4/27	2/27

Find :

- Marginal probability distributions of X and Y
- $E(X)$, $E(Y)$
- $V(X)$, $V(Y)$
- Conditional distribution of Y given $X = 1$.



10. The following table gives the duration of the training and the completion time (in hours) of a job in a computer :

Duration of the training :	10	15	20	22	25	27	30
Completion time :	13	12	15	10	8	11	9

Calculate Pearson's coefficient of correlation and two regression lines. Also estimate the expected completion time if the duration of the training is 28 hours.

11. a) Three machines A, B, C manufacture respectively 35%, 45% and 20% of the total production. The percentage of items produced by A, B and C are 2, 4 and 3 respectively are defective. If an item is chosen at random and is found defective. What is the probability of it being a product of B ? 5

b) In a random sample of 500 families owning Television sets in the city of Bengaluru it is found that 300 families have purchased DTH equipment. Find 95% and 99% C.I. for the actual proportion of families in this city who purchased DTH. 5

12. a) Derive mean and variance of Poisson distribution. 5

b) The average monthly sales of 2000 firms are normally distributed with mean ₹ 26,000 and standard deviation of ₹ 6,000. Find :
i) The number of firms for which the sales exceed ₹ 32,000.
ii) The numbers of firms with sales between ₹ 28,000 and ₹ 32,000. 5

13. a) Fit a straight line trend to the following data by the method of least squares :

Year :	2010	2011	2012	2013	2014	2015
Production ('000 tons) :	83	92	74	90	106	115

Estimate the production for the year 2016 and 2017. 5

b) A group of 350 adults who participated in a health survey were asked whether they were on diet. The responses by sex are as follows :

	Male	Female
On diet	14	25
Not on diet	159	152

Do these data support that being on diet is independent on sex ? 5



14. The following data gives the no. of units of production per day turned out by four different types of machines :

Employee	Type of Machine			
	M1	M2	M3	M4
E1	40	36	45	30
E2	38	42	50	41
E3	36	30	48	35
E4	46	47	52	44

Test the hypothesis that mean production is same for the 4 machines and employees do not differ with respect to mean productivity.



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Instruction : Answer any five from Part – A, any four from Part – B.

PART – A

Answer any five questions :

(5×6=30)

1. a) Two cards are drawn at once from a deck of playing cards, find the probability that : 3
i) 1 is club and other is heart ii) both belongs to same colour.
b) If A and B are independent then prove that \bar{A} and \bar{B} are also independent. 3
2. A random variable X has the following probability distribution :

Value of x :	0	1	2	3	4	5	6	7
P (x) :	0	K	2K	2K	3K	K ²	2K ²	7K ² + K

Find K, Mean and variance of the distribution.

3. a) State and prove Baye's theorem. 4
b) Find a constant 'C' such that 2
$$f(x) = \begin{cases} Cx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$
 is a P.d.f
4. a) For the following data calculate the coefficient of correlation between the variables x and y 4

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

- b) In a bivariate data on x and y, $\text{Var}(x) = 49$, $\text{Var}(y) = 9$, $\text{Cov}(x, y) = -17.5$.
Find the coefficient of correlation between x and y. 2

P.T.O.



5. A container has 100 electric lamps, 20 of which are defective and 10 are selected at random, find the probability that :
- all are defective
 - Atleast one is defective
 - all are good
 - atmost 3 are defective
6. The mean height of 50 female students who showed above average participation in Annual sports was 68.2 inches with a standard deviation of 2.5 inches; while 50 female students who showed no interest in such participation had a mean height of 67.5 inches. With a standard deviation of 2.8 inches. Test the hypothesis that the female students who participated in annual sports are taller than other female students.
7. Fit an equation of the form $y = ab^x$ to the following data :

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.6

8. Apply the method of semi-averages for determining trend of the following data and estimate the value for 2000.

Years	1993	1994	1995	1996	1997	1998
Sales (thousand units)	20	24	22	30	28	32

PART - B

Answer any four questions :

(4×10=40)

9. For the following bivariate probability distribution of X and Y. Find :
- Marginal density of X and Y
 - $P(X \leq 1)$
 - $P(X \leq 1, Y = 2)$
 - $P(Y = 3)$
 - $P(Y \leq 3)$ and
 - $P(X < 3, Y < 4)$

X \ Y	1	2	3	4	5	6
0	0	0	$\frac{1}{32}$	$\frac{2}{32}$	$\frac{2}{32}$	$\frac{3}{32}$
1	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
2	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{64}$	$\frac{1}{64}$	0	$\frac{2}{64}$



10. a) Calculate the rank correlation of the marks obtained by 10 students in the subjects.

4

History	42	68	92	48	81	52	39	78	22	11
Economics	32	52	82	62	72	42	22	92	02	12

- b) The following data gives the height (x cms) and weight (y kgs) of 6 employees. Obtain the two regression equations. Also, find the expected height of an employee whose weight is 60 kgs.

6

x (cms)	153	157	168	160	170	163
y (kgs)	48	50	50	49	54	53

11. a) M1, M2 and M3 are the three machines which produce respectively 60%, 30% and 10% of the total production of the factory. The percentage of defective output of these machines are respectively 2%, 3%, and 4%. An item is selected at random and is found to be defective. Find the probability that the items were produced by machine M3.
- b) An engineering college has 4 branches, computer science, civil, electrical and mechanical. Suppose 500 students out of which 200 are female and 300 are male, are distributed in the 4 branches as below. Test whether branch choice is related to gender. Test at 5% level of significance.

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	CS	Civil	Electrical	Mechanical
Female	50	50	50	50
Male	100	80	70	50

12. a) The number of vehicles joining a fuel queue in a petrol bunk has Poisson distribution with parameter 5.8. Find the probability that:
- i) No vehicle joins the fuel queue in a particular minute.
- ii) 2 or more vehicles join the fuel queue in the minute.

5



b) Mean life of electric bulbs manufactured by a firm is 1200 hrs. and was normally distributed with standard deviation of 200 hrs. 5

i) In a box of 10,000 bulbs, how many bulbs are expected to have life of 1050 hrs or more ?

ii) What is the percentage of bulbs which are expected to fuse before 1500 hrs of service ?

13. a) The following are the values of production (in thousand quintals) of a sugar factory 8

Year	1992	1994	1996	1998	2000	2002	2004
Production	77	81	88	94	94	96	98

i) Fit a straight line trend using least square method.

ii) Graph the observed values and the trend values.

iii) Estimate the production in the year 2006.

b) Name the components of time series. 2

14. A factory bought three new grinding machines of different brands and wishes to determine whether one of them grinds better and faster than others. The grinders were used for 5 hrs. and the values are observed at random from each grinder and the results are given below :

Observed values :

Grinder A : 30 25 36 38 31

Grinder B : 35 31 39 38 42

Grinder C : 24 30 28 25 28

Use analysis of variance technique to determine whether the grinders are significantly different in their mean grinding capacity.

Test at 5% level of significance.