



III Semester M.C.A. Examination, January 2017
(CBCS Scheme)
COMPUTER SCIENCE
MCA 304 : Statistical Analysis

Time : 3 Hours

Max. Marks : 70

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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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
- $$f(x) = \begin{cases} Cx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases} \text{ is a P.d.f}$$
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 :
- i) all are defective ii) Atleast one is defective
 iii) all are good iv) 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 :

(4x10=40)

9. For the following bivariate probability distribution of X and Y. Find :

- i) Marginal density of X and Y ii) $P(X \leq 1)$
 iii) $P(X \leq 1, Y = 2)$ iv) $P(Y = 3)$
 v) $P(Y \leq 3)$ and vi) $P(X < 3, Y < 4)$

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.

5

5

	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:
- No vehicle joins the fuel queue in a particular minute.
 - 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.