Final Assessment Test(FAT) - Nov/Dec 2024

Programme	M.C.A.	Semester	Fall Semester 2024-25
Course Code	PMAT501L	Faculty Name	Prof. Revathi G K
Course Title	Probability and Statistics	Slot	E1+TE1
		Class Nbr	CH2024250103122
Time	3 hours	Max. Marks	100

General Instructions

- Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.

Course Outcomes

1. Identifying the basic probability concepts using real time problems.
2. Understanding the facts of random variables and find an appropriate distribution for analysing data specific to an experiment.
3. Apply statistical methods like correlation, regression analysis in analysing,interpreting experimental data.
4. Make appropriate decisions using statistical inference that is the central to experimental research.
5. Analyse estimation and relate the testing methods to make inference and modelling techniques for decision making.

Section - I
Answer any 10 Questions (10 × 10 Marks)

*M - Marks

Q.No	Question	*M	CO	BL
01.	a. In a shooting test, the probability of hitting the target is $\frac{1}{2}$ for A, $\frac{2}{3}$ for B and $\frac{3}{4}$ for C. If all of them fire at the target, find the probability that (i) none of them hits the target (2.5 Marks) (ii) atleast one of them hit the target. (2.5 Marks) b. If a continuous random variable X has probability density function $f(x) = k\,x^2 e^{-x}$, $0 \leq x$ then find (i) k (1 mark) (ii) Mean (2 Mark) (iii) variance (2 Mark)	10	1,2	5
02.	A bag contains 5 balls and it is not known how many of them are white. two balls are drawn at random from the bag and they are noted to be white. What is the chance that all the balls in the bag are white?	10	1	5

| | | 10 | 2 | 3 |

03. The joint p.m.f of (X, Y) is given in the following table

X \ Y	0	1	2
0	0.1	0.04	0.06
1	0.2	0.08	0.12
2	0.2	0.08	0.12

(i) Find the marginal p.m.f of X and Y respectively. (3 Marks)
(ii) verify whether X and Y are independent. (3 Marks)
(iii) Find covariance of (X,Y). (4 Marks)

04. Calculate the correlation coefficient for the following Sales in Rupees (X) and Advertising expenditure in Rupees (Y)   10   3   3

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

05. (a) A computer while calculating the regression lines from 25 pairs of observations obtained   10   2,3   3
from the following constants $n = 25$, $\sum x = 125$, $\sum x^2 = 650$, $\sum y = 100$, $\sum y^2 = 460$,
$\sum xy = 508$. A recheck showed that two pairs of values (6,14) and (8,6) were wrong while the correct values were (8,12) and (6,8). Obtain the correct value of x when $y = 20$. (5 Marks).
(b) Assume that the number of cars passing by a traffic junction obey a Poisson distribution. If the probability of no cars in one minute is 0.20, what is the probability of more than one car in 2 minutes. (5 Marks)

06. (a) There is a rainfall in a certain place for 10 days in every thirty days. Find the probability that   10   2   3
(i) There is rainfall on at least 3 days of a given week. (2.5 Marks)
(ii) The first four days of a given week will be wet and the remaining days dry. (2.5 Marks)
(b) In a newly constructed township, 2000 electric lamps are installed with an average life of 1000 burning hours and standard deviation of 200 hours. Assuming the life of the lamps follows normal distribution, find
(i) The number of lamps expected to fail during the first 700 hours. (2.5 Marks)
(ii) In what period of burning hours 10% of lamps fail (2.5 Marks)

07. (a) Twenty people were attacked by a disease and only 18 survived. Will you reject the   10   4   4
hypothesis that the survival rate, if attacked by this disease, is 85% in favour of the hypothesis that it is more, at 5% level. (5 Marks)
(b) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal, are same against that they are not, at 5% level. (5 Marks)

| | | | | | | | | 10 | 4 | 4 |

08. (a) In a survey of buying habits. 400 women shoppers are chosen at random in super market 'A' located in a certain section of the city. Their average weekly food expenditure is Rs. 250 with a standard deviation of Rs. 40. For 400 women shoppers chosen at random in super market 'B' in another section of the city. the average weekly food expenditure is Rs. 220 with a standard deviation of Rs. 55. Test at 1% level of significance whether the average weekly food expenditure of the two populations of shoppers are equal.(5 Marks)

(b) The mean breaking strength of the cables supplied by a manufacturer is 1800 with standard deviation of 100. By a new technique in the manufacturing process, it is claimed that the breaking strength of the cable has increased. To test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850. Can we support the claim at 1% LOS? (5 Marks)

[Marks: 10 4 4]

09. Theory predicts that the proportion of beans in 4 groups A, B,C and D should be 7:3:4:2. In an experiment among 1600 beans , the number in 4 groups were 880, 315, 290, 115. Does the experiment support the theory?

[Marks: 10 4 3]

10. Two independent samples of 8 and 7 items respectively had the following values of the variable.

Sample 1	9	10	14	11	15	10	13	14
Sample 2	9	13	11	13	9	8	10	

(i) Is there any significance difference between the population variance? (5 Marks)
(ii) Is there any significance difference between sample means? (5 Marks)

[Marks: 10 4 4]

11. A sociologist is interested in comparing the ages of husbands and wives. He collected the data below, which shows the ages for the husband and wife in a random chosen sample of nine couples.

Couple	A	B	C	D	E	F	G	H	I
Husband's age (years)	79	39	55	71	37	39	48	63	54
Wife's age (years)	70	36	49	54	38	32	49	52	56

Use these data to test the hypothesis that most men are older than their wives using sign test.
Carry out your tests at 5% significance level

[Marks: 10 5 3]

12. A school counselor wanted to study whether gender difference exists in students with regard to mathematical ability. The mathematical ability scores of Male and female students are given in the table.

Male	6	13	7	11	5	8	14
Female	10	16	12	14	17	13	7

Test the claim at 5% LOS by using Mann Whitney U Test.

[Marks: 10 5 3]

BL-Bloom's Taxonomy Levels - (1.Remembering, 2.Understanding, 3.Applying, 4.Analysing, 5.Evaluating, 6.Creating)

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