



Final Assessment Test - May 2024

Course: BMAT202L - Probability and Statistics

Class NBR(s): 1662 / 1665 / 1673 / 1744 / 2271 /
2275 / 2278 / 2291 / 2295

Slot: D2+TD2

Time: Three Hours

Max. Marks: 100

- > KEEPING MOBILE PHONE/ELECTRONIC DEVICES EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
> DON'T WRITE ANYTHING ON THE QUESTION PAPER

General Instructions:

Statistical Tables are permitted

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. From the following table showing the wage distribution in a certain factory. [10]
determine:

- (a) the mean wage,
(b) the median wage,
(c) the modal wage.

Weekly Wages (Rs.):	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of Employees:	12	30	34	65	45	25	18

2. Goals scored by two teams in a football match were as follows: [10]

No. of Goals Scored in a Football Match	No. of Football Matches Played	
	Team 'A'	Team 'B'
0	15	20
1	10	10
2	7	5
3	5	4
4	3	2
5	2	1

Calculate coefficient of variation and state which team is more consistent.

3. For a sack of fruit containing 3 oranges, 2 apples, and 3 bananas, a random sample of 4 pieces of fruit is selected. If X is the number of oranges and Y is the number of apples in the sample, find [10]

- (a) the joint probability distribution of X and Y
(b) the marginal distribution of X and Y
(c) $P[(X, Y) \in A]$, where $A = \{(x, y) : x + y \leq 2\}$.

4. Let X and Y have the joint probability density function [10]

$$f(x, y) = \begin{cases} x^2 + \frac{xy}{3}, & 0 \leq x \leq 1, 0 \leq y \leq 2, \\ 0, & \text{otherwise.} \end{cases}$$

Find

(a) $P(X > \frac{1}{2})$,

(b) $P(Y < X)$,

(c) $P(Y < \frac{1}{2}, X < \frac{1}{2})$,

(d) Verify whether X and Y are independent random variables.



5. Obtain the correlation coefficient for the following ages of husbands (X) and wives (Y): [10]

X:	23	27	28	28	29	30	31	33	35	36
Y:	18	20	22	27	21	29	27	29	28	29

6. The following data relate to the scores obtained by 9 salesmen of a company in an intelligence test and their weekly sales in thousand rupees: [10]

Salesmen	A	B	C	D	E	F	G	H	I
Intelligence:									
Test Scores:	50	60	50	60	80	50	80	40	70
Weekly Sales:	30	60	40	50	60	30	70	50	60

- (a) Obtain the regression equation of sales on intelligence test scores of the salesmen,
 (b) If the intelligence test score of a salesmen is 65, what would be his expected weekly sales?

7. It is known that the probability of an item produced by a certain machine will be defective is 0.05. If the produced items are sent to the market in packets of 20, find the number of packets containing at least, exactly, and at most 2 defective items in a consignment of 1000 packets using [10]

- (a) Binomial distribution,
 (b) Poisson distribution.

8. Of a large group of men 5% are under 60 inches in height and 40% are between 60 and 65 inches. Assuming a normal distribution, find the mean height and standard deviation. [10]

9. A company has the head office at Kolkata and a branch at Mumbai. The personnel director wanted to know if the workers at two places would like the introduction of a new plan of work and a survey was conducted for this purpose. Out of sample of 500 workers at Kolkata, 62% favoured the new plan. At Mumbai out of a sample of 400 workers, 41% were against the new plan. Is there any significant difference between the two groups in their attitude towards the new plan at 5% level? [10]

10. The mean height and the standard deviation height of 8 randomly chosen soldiers are 166.9 c.m. and 8.29 c.m., respectively. The corresponding values of 6 randomly chosen sailors are 170.3 c.m. and 8.50 c.m., respectively. Based on this data, can we conclude that soldiers are, in general, shorter than sailors at 5% level of significance? [10]

11. When the first proof of 392 pages of a book of 1200 pages was read, the distribution of printing mistakes was found to be as follows: [10]

No. of Mistakes in a Page:	0	1	2	3	4	5	6
No. of Pages:	275	72	30	7	5	2	1

Fit a Poisson distribution to the above data and test the goodness of fit.

12. The time to failure in operating hours of a critical solid-state power unit has the hazard rate function $\lambda(t) = 0.003 \left(\frac{t}{500}\right)^{0.5}$, for $t \geq 0$. [10]

- (a) What is the reliability if the power unit must operate continuously for 50 hours?
 (b) Determine the design life if a reliability of 0.90 is desired,
 (c) Compute the MTTF.

