

MATH-II

Paper - BSC-MATH-104-G

Probability and Statistics

Time allowed : 3 hours]

[Maximum marks : 75

Note: Attempt five questions in total by selecting one question from each unit. Question no. 1 is compulsory.

1. (a) Define probability spaces.
(b) Explain multinomial distribution.
(c) State memoryless property of exponential distribution.
(d) Fit a straight line $y = a + bx$ to the following data by method of least squares.

x	0	1	3	6	8
y	1	3	2	5	4

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- (c) Explain 3.
- (i) Null hypothesis
(ii) Alternative hypothesis
(iii) Level of significance
- (f) A random sample of 27 pair of observations from a normal population gives a correlation coefficient of 0.6. Is this significant of correlation in population? 15

Unit - I

2. (a) A purse contains two silver coins and four copper coins. A second purse contains four silver and three copper coins. If a coin is pulled out at random from one of the two purses, what is the probability that it is a silver coin?
- (b) Four coins are tossed. What is the expectation of number of heads? 15

3. (a) State and prove Chebyshev's inequality.
- (b) A car-hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which neither car is used and the proportion of days on which some demand is refused ($e^{-1.5} = 0.2231$).

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Unit - II

4. (a) Is the function given below a density function?

$$f(x) = \begin{cases} 0 & \text{for } x < 2 \\ \frac{1}{18}(3 + 2x) & \text{for } 2 \leq x \leq 4 \\ 0 & \text{for } x > 4 \end{cases}$$

Also find $P(2 \leq x \leq 3)$.

- (b) The mean height of 500 male students in a certain college is 151 cm and standard deviation is 15 cm. Assuming the heights are normally distributed, find how many students have heights between 120 and 155 cm?
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5. (a) If X and Y are independent continuous random variables, then find p.d.f of variable $X + Y$.
- (b) A bag X contains 2 white and 3 red balls and a bag Y contains 4 white and 3 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag Y.

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Unit - III

6. (a) The following table shows the marks obtained by 100 candidates in an examination. Calculate the mean and standard deviation.

Marks obtained	1-10	11-20	21-30	31-40	41-50	51-60
No. of Candidates	3	16	26	31	16	8

- (b) Compute skewness and kurtosis, if the first four moments of a frequency distribution $f(x)$ about the value $x = 4$ are respectively 1, 4, 10 and 45.

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- (a) Calculate correlation coefficient for the following:

x	5.1	5.3	5.6	5.7	5.8	5.9	5.10	5.11	6.0	6.1
y	11	17	19	14	8	15	20	6	18	12

- (b) Following table gives the data on rainfall and discharge in a certain river. Obtain the lines of regression of y on x . <https://www.mdustudy.com>

Rainfall x (inches)	1.53	1.78	2.6	2.95	3.42
Discharge y (1000 ce)	33.5	36.3	40.0	45.8	53.5

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Unit - IV

8. (a) In a sample of 600 men from certain city, 450 are found smokers. In another sample of 900 men from another city, 450 are smokers. Do the data indicates that the cities are significantly different with respect to the habit of smoking among men?

- (b) A random sample of size 25 form a normal population has the mean $\bar{x} = 47.5$ and s.d $s = 8.4$. Does this information refute the claim that the mean of the population is $\mu = 42.1$.

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9. (a) In two groups of ten children each, the increase in weight due to different diets during the same period, were in pounds

3, 7, 5, 6, 5, 4, 4, 5, 3, 6

8, 5, 7, 8, 3, 2, 7, 6, 5, 7

Is there a significant difference in their variability.

- (b) The theory predicts the proportion of beans in the four groups, G_1 , G_2 , G_3 , G_4 should be in ratio $9 : 3 : 3 : 1$. In an experiment with 1600 beans the numbers in four groups were 882, 313, 287 and 118. Does the experimental results support the theory?

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