Seat No. : _____

# AL-106

**April-2018**

**B.Sc., Sem.-II**

**CC-3, Paper-103 : Statistics – II**

**(New Course)**

**Time : 3 Hours]** **[Max. Marks : 70**

1. (a) Define mathematical probability and then state and prove addition rule of probability of two events.

**OR**

Define axiomatic approach of probability. If A and B are any two events such that $B \subset A$, then prove that $P(B) \leq P(A)$.

(b) Explain multiplicative law of probability.

**OR**

In a bolt factory machines A, B & C manufacture respectively 25%, 35% and 40% of the total of their output 5, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B & C ?

2. (a) Describe probability mass function and probability density function with illustrations.

**OR**

Define conditional expectation and conditional variance and also discuss independence of random variables.

(b) Explain moment generating function and cumulant generating function.

**OR**

Explain factorial moment generating function with properties and uses.

3. (a) State and prove Boole's inequality.

**OR**

State and prove Markov's inequality.

(b) Explain concept of convex and concave functions.

**OR**

State and prove Chebyshev's inequality.

4. (a) What is marginal and conditional distributions ?

**OR**

Define product raw moments and product central moments.

(b) Explain joint probability mass function and joint probability density function.

**OR**

If the joint probability distribution of X and Y is given by $f(x, y) = \frac{x + y}{30}$, for $x = 0, 1, 2, 3$; $y = 0, 1, 2$. Find $P(X \leq 2, Y = 1)$, $P(X > Y)$ and marginal of X.

5. Answer the following questions :

(1) What is conditional probability ?

(2) Define mutually exclusive events with diagram.

(3) What is cumulative distribution function ?

(4) State Bonferroni's inequality.

(5) What is conditional expectation ?

(6) Describe factorial moments.

(7) What is Skewness ?

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1. (a) State the relative and absolute measures of dispersion and describe the merits and demerits of Quartile deviation.

**OR**

The first of the two samples has 100 items with mean 15 and standard deviation 3. If the whole group has 250 items with mean 15.6 and standard deviation $\sqrt{13.44}$. find the standard deviation of the second group.

(b) Define factorial moment. Obtain factorial moment of order r about the origin of the distribution.

**OR**

Write a short note on Bowley's co-efficient of skewness.

2. (a) In usual notations state and prove Bayes theorem of probability.

**OR**

Explain pairwise independent events and mutually independent events.

(b) For any three events A, B & C, prove that $P(A \cup B/C) = P(A/C) + P(B/C) - P(A \cap B/C)$.

**OR**

In a factory three units are produced from three units in the ratio 2 : 3 : 5. There are 5%, 4% and 3% defective units produced by these three machines. One particular day if any one unit is selected at random from total production and is found to be defective then find probability that it is produced by third machine.

3. (a) What is time series ? Explain the components of it.

**OR**

Write a short note on Graphical method of determining trend.

(b) Write a note on ratio to moving average and ratio to trend methods of measuring seasonal variation in time series.

**OR**

What is the meaning of seasonal variations ? Explain the method of seasonal indices.

4. (a) What is the meaning of Decision Theory ? Explain principles of decision making.

**OR**

A dairy firm wants to determine the quantity of butter it should produce to meet the demand past records have shown the following demand patterns :

| **Quantity required (kg)** | 15 | 20 | 25 | 30 | 35 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| **No. of days demand occurred** | 0.03 | 0.07 | 0.1 | 0.4 | 0.2 | 0.15 | 0.05 |

Construct a conditional profit table and determine EMV.

(b) Write a short note on EMV and EVPI.

**OR**

State difference between 'decision making under risk' and 'decision making under uncertainty'.

5. Answer the following questions :

(1) Define Quartile Deviation.

(2) Write measures of Skewness.

(3) Write definition on pairwise independent events.

(4) Which component of time series is mainly applicable in the following cases ?

(a) Sales of readymade garments in Diwali.

(b) Increase in price of milk and vegetables during riots.

(5) The seasonal average of four seasons $Q_1$, $Q_2$, $Q_3$, $Q_4$ are respectively 80.75, 55.25, 50.50 and 57.50. Calculate seasonal index for each of the season.

(6) Explain EOL.

(7) Explain Payoff table.