

[Time: 2:30 hours]

[Marks: 75]

**N.B.:**

1. All questions are compulsory carrying 15 marks each.
2. Figures to the right indicate marks of sub questions.
3. Use of a simple calculator is allowed.
4. Use of a scientific calculator, digital diary or a mobile phone is NOT allowed.

Q.1 A) Choose the correct alternatives from the following (Any Eight). (08)

- 1) For the data 50, 60, 30, 40, 70, 90 coefficient of range is \_\_\_\_\_.  
a) 60                                      b) 120                                      c) **.5**                                      d) .4
- 2) If there are two groups with 100 observations each with 60 and 70 kg as the values of their arithmetic means, then the combined mean of 200 observations is \_\_\_\_\_.  
a) 67                                      b) **65**                                      c) 70                                      d) none of these
- 3) \_\_\_\_\_ is a measure of dispersion.  
a) Mean                                      b) Median                                      c) **Mean Deviation**                                      d) None of these
- 4) The median of 13 observations is 60. If 4 new observations 40, 50, 67, 75 are added to it, then the median of the new group of 17 values is \_\_\_\_\_.  
a) 75                                      b) 67                                      c) 50                                      d) **60**
- 5) The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow  
a) 0.25                                      b) 0.145                                      c) **0.15**                                      d) none of these
- 6) Probability of drawing an ace from a deck of 52 cards is  
a) 1/52                                      b) 1/26                                      c) **1/13**                                      d) 3/52
- 7) A pessimistic decision making criterion is  
a) **Maximin**                                      b) Equally Likely                                      c) Maximax                                      d) Laplace
- 8) A \_\_\_\_\_ probability is the probability that an event will occur given that another event has already occurred.  
a) Subjective                                      b) **Conditional**                                      c) Objective                                      d) Binomial
- 9) The ratio of a new price to the base year price multiplied by 100 is called the \_\_\_\_\_.  
a) Price Absolute                                      b) Price Decrease                                      c) **Price Relative**                                      d) Price Increase
- 10) \_\_\_\_\_ percentage of observations have values less than third quartile.  
a) 25                                      b) **75**                                      c) 50                                      d) 100

B) State whether the following statements are True or False (Any Seven).

1. The difference between the largest and the smallest data values is the coefficient of range. **F**
2. The most frequently occurring value of a data set is called the Mode. **T**
3. The median of a data set with 11 items would be the value of the 6th items in the ordered array. **T**

4. Extreme values in a data set have a strong effect on median. **F**
5. Standard deviation is equal to the square root of the variance. **T**
6. There is no difference between variance and coefficient of variation. **F**
7. By using Maximax criterion the decision maker attempts to avoid regret. **T**
8. In Decision tree square box denotes state of nature and the Circle denotes decision point. **F**
9. Probability of a certain event is zero. **F**
10.  $P(A^C) = 1 - P(A)$ . **T**

Q.2 a) Find the coefficient of variation for the following data. (08)

Age in years	10-20	20-30	30-40	40-50	50-60
Number of mobile users	8	12	20	14	10
Mid Value	15	25	35	45	55
FX	120	300	700	630	550
FX*X	1800	7500	24500	28350	30250

XBAR	35.9375	XBAR^2	1291.504
SD	12.33880439	$\sum FXX/\sum F$	1443.75
CV	34.33406439		

b) Draw a histogram for the following data and hence locate the mode. (07)

Marks	0-20	20-40	40-60	60-80	80-100
No. of Students	2	5	7	4	3

**Draw histogram Then MODE (Approx.) = 48**

**OR**

p) Calculate mean deviation from mode for the following data. (08)

Marks	0-10	10-20	20-30	30-40	40-50
Number of Students	4	8	12	6	4
Mid Value	5	15	25	35	45
X-Z	19	9	1	11	21
F* X-Z	76	72	12	66	84

$$\text{MODE} = 20 + \frac{[(12-8)*10]}{(24-8-6)} = 20 + \frac{40}{10} = 24$$

$$\text{M.D.} = \frac{\sum F*|X-Z|}{\sum F} = \frac{310}{34} = 9.1176$$

q) Calculate Arithmetic Mean and Median for the following data. (07)

Wages	0-5	5-10	10-15	15-20	20-25
No. of Workers	4	7	10	6	3
X	2.5	7.5	12.5	17.5	22.5
F*X	10	52.5	125	105	67.5
CF	4	11	21	27	30

$$\text{A.M} = \frac{\sum FX}{\sum F} = \frac{360}{30} = 12$$

$$\text{MEDIAN} = 10 + \frac{(15-11)*5}{10} = 10 + 2 = 12$$

Q.3 a) In a class of 100 students, 70 passed in Accounts, 60 passed in Economics and 40 passed in both. A student is selected at random. Find the probability that the student has (i) passed in Accounts or Economics or both (ii) failed in both subjects. (08)

**(i) Passed in Accounts or Economics or both = 0.7 + 0.6 - 0.4 = 0.9**

**(ii) Failed in both subjects = 1 - 0.9 = 0.1**

**Or by Venn diagram**

b) In a restaurant, the following distribution is found for the daily demand of plain cheese pizzas. Find the expected daily demand E(X) and also the variance V(X). (07)

<b>No. of Plain Cheese Pizzas</b>	15	16	17	18	19
<b>Probability</b>	0.1	0.2	0.3	0.3	0.1
<b>PX</b>	1.5	3.2	5.1	5.4	1.9
<b>PX*X</b>	22.5	51.2	86.7	97.2	36.1

**$E(X) = \sum PX = 17.1$**

**$V(X) = \sum PX^2 - E(X)^2 = 293.7 - 17.1^2 = 1.29$**

**OR**

p) If A, B are events such that P(A) = 0.8, P(B) = 0.6 and P(AUB) = 0.9, then find

(i) P (A ∩ B) (ii) P (A/B) (iii) P(B/A) (08)

**(i) P (A ∩ B) = 0.8 + 0.6 - 0.9 = 0.5**

**(ii) P (A/B) = 0.5 / 0.6**

**(iii) P (B/A) = 0.5 / 0.8**

q) Calculate cost of living index number for the following table: (07)

<b>Group</b>	<b>Group Index</b>	<b>Group Weight</b>	<b>IW</b>
Food	250	45	11250
Fuel & Lighting	200	15	3000
Clothing	180	7	1260
House Rent	250	18	4500
Miscellaneous	200	15	3000

**INDEX NO. =  $\sum IW / \sum W = 23010/100 = 230.1$**

Q.4 a) Based on the following pay-off table decide on the product to be launched, by calculating the Expected Monetary Values (EMVs). (08)

<b>Demand</b>	<b>Probability</b>	<b>Product to be launched</b>			
		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Low</b>	0.35	60	56	51	45
<b>Moderate</b>	0.25	70	59	73	77
<b>Good</b>	0.25	84	91	94	103
<b>High</b>	0.15	95	104	110	118

**EMV A = 21+17.5+21+14.25 = 73.75**

**EMV B = 19.6+14.75+22.75+15.6 = 72.7**

**EMV C = 17.85+18.25+23.5+16.5 = 76.1**

**EMV D = 15.75+19.25+25.75+17.7 = 78.45**

**Product to be launched = D**

b) Find Laspeyre's, Paasche's and Fisher's Index Numbers for the year 2010 with 2000 as the base year. (07)

Commodity	2000		2010		P0Q0	P1Q0	P0Q1	P1Q1
	Price	Quantity	Price	Quantity				
A	5	15	12	20	75	180	100	240
B	4	24	10	28	96	240	112	280
C	7	26	9	31	182	234	217	279
D	12	10	22	13	120	220	156	286
E	6	12	14	15	72	168	90	210
					545	1042	675	1295

$$\Sigma P_0Q_0 = 545$$

$$\Sigma P_1Q_0 = 1042$$

$$\Sigma P_0Q_1 = 675$$

$$\Sigma P_1Q_1 = 1295$$

$$\text{Laspeyre's Index Number} = I_L = (\Sigma P_1Q_0 / \Sigma P_0Q_0) * 100 = 191.19$$

$$\text{Paasche's Index Number} = I_P = (\Sigma P_1Q_1 / \Sigma P_0Q_1) * 100 = 191.85$$

$$\text{Fisher's Index numbers} = \text{SQRT}(I_L * I_P) = 191.52$$

**OR**

p) The following pay-off table shows pay-offs associated with different number of sweaters stocked by a vendor under different conditions of winter season. Decide on the number of sweaters he should keep in stock, by using (i) Maximin (ii) Maximax (iii) Laplace criterion. (08)

State of the Winter Season	Number of Sweaters in stock			
	200	250	300	350
Light	27	25	20	17
Medium	30	32	32	30
Severe	35	40	43	45
Very Severe	40	42	45	46
Maximin	27	25	20	17
Maximax	40	42	45	46
Laplace	33	34.75	35	34.5

(i) Maximin = 200 Sweaters

(ii) Maximax = 350 Sweaters

(iii) Laplace criterion = 300 Sweaters

q) Calculate the index number for the year 2000 taking 1995 as the base year, using

(i) Weighted aggregate method (ii) Weighted average of price relative method (07)

Commodity	Price (Rs./Kg) (1995)	Price (Rs./Kg) (2000)	Weight	P0W	P1W	P	PW
Rice	39	42	25	975	1050	107.69	2692.31
Wheat	16	25	35	560	875	156.25	5468.75
Pulses	46	51	15	690	765	110.87	1663.04
Sugar	27	34	15	405	510	125.93	1888.89
Tea	38	45	10	380	450	118.42	1184.21

(i) **Weighted aggregative method**

$$\Sigma POW=3010 \quad \Sigma P1W=3650 \quad \text{Index Number} = (3650/3010)*100=121.2625$$

(ii) **Weighted average price relative method**

$$\Sigma PW= \Sigma W = \text{Index Number} = 12897.2/100 = 128.972$$

Q.5

a) Draw a decision tree for the decision making problem below and suggest the best action (Use EMV criteria). (08)

State of Nature	Probability	Actions	
		A <sub>1</sub>	A <sub>2</sub>
S <sub>1</sub>	0.6	45	40
S <sub>2</sub>	0.4	55	60

**Tree Diagram Then**

$$\text{EMV A1} = 27 + 22 = 49$$

$$\text{EMV A2} = 24 + 24 = 48$$

**Optimal decision Action option is A1**

b) The probability that X can solve a mathematics problem is 0.6 and the probability that Y can solve it is 0.7. If both try independently, find the probability that (07)

i) Only X solves the problem.

ii) Only Y solves the problem.

iii) The problem is solved.

$$\text{(i) Only X solves the problem} = 0.6 * 0.3 = 0.18$$

$$\text{(ii) Only Y solves the problem} = 0.4 * 0.7 = 0.28$$

$$\text{(iii) The problem is solved} = 0.6 + 0.7 - 0.42 = 0.88$$

**Or by Venn diagram**

**OR**

Write short notes on **ANY THREE** of the following. (15)

a) Define the following terms with examples

(i) Sample Space (ii) Mutually Exclusive Events (iii) Conditional Probability.

b) Define the term Arithmetic Mean and state any two of its properties.

c) What is dispersion? Explain with a suitable example.

d) Write a note on Decision Tree.

e) What is an Index Number?

**THEORY USE YOUR DISCRETION**