



**SHAH**  
EDUCATIONAL ACADEMY  
Bandra West | Vile Parle West

**H. O. :** Shop No. 5, Hill Crest Society, 16<sup>th</sup> Road, Bandra (W),  
Mum: 50. Ph: 26051635 / 9820422953

**Branch :** Avon Arcade, Shop No. A/121, 1<sup>st</sup> Fl., Vile Parle (W),  
Mumbai: 56. Ph: 9820418533

**F.Y.B.M.S**  
**Sem – I**

**Business Statistic Test:**

**Marks:- 75**  
**Time:- 2 ½ hrs.**

**N.B.:-** (1) All question are compulsory; (2) In Q.1 attempt both the sub – parts A & B ; (3) Figures to the right indicate Marks; (4) Use of non- programmable calculator is allowed; (5) Graph paper will be provided on request.

**Q.1.(A)** Fill the blanks with the correct alternative **(Any 8):** **(8)**

1. The data collected for the first time is known as \_\_\_\_\_  
(Information; Secondary data; Primary data)
2. The histogram can be used to locate graphically the value of \_\_\_\_\_  
(Mean; Median; Mode)
3. The middle most observation that divides the entire distribution into two equal parts is known as \_\_\_\_\_ (Mean; Median; Mode)
4. If the value of coefficient of variation is more, then the consistency of the data is \_\_\_\_  
( more, less, same)
5. The correlation is positive if \_\_\_\_\_  
(x increase as y increases; x increases as y decreases; none of these)
6. A \_\_\_\_\_ is a sequence of value of a phenomenon arranged in order of their occurrence. (Time series; Index number; None of these)
7. The index number for base period is \_\_\_\_\_ taken as 100.  
(Always; Sometimes; Never)
8. A variable X capable of taking discrete values  $x_1, x_2, \dots, x_n$  with respective probabilities  $p_1, p_2, \dots, p_n$  is called as \_\_\_\_\_ random variable.  
(discrete; continuous; none)
9. For a statistical experiment every possible outcome is called \_\_\_\_\_  
(sample; sample point ; space)
10. Maximum criterion is a decision making under \_\_\_\_\_  
(risk; uncertainty; certainty)

**P.T.O.**

**Q.1.(B)** State whether the following statements are “True or False” **(Any 7):** **(7)**

1. A bivariate frequency distribution represents frequencies with reference to two variables at a time.
2. Pie diagram is represent by using circles..
3. Quartiles are measures of central tendency.
4. Standard deviation is denoted by  $r$ .
5. If events A and B are exhaustive events then  $A \cup B$  is a null set.
6. A symmetric distribution has the values of all measures of central tendency identical.
7. Each of the group or selections which can be made by taking some or all of a number of things without reference to the order of the things in each group is called a permutation.
8. There are four components of time series.
9. If correlation coefficient is zero then the association between the two variables is perfect positive.
10. If the upper limits are excluded then it is called inclusive types of class intervals.

**Q.2. Attempt either (A) or (B):**

**(A) (i) Calculate Median and Mode for the following data.** **(8)**

Class	10 – 30	30 – 50	50 – 70	70 – 90	90 – 110	110 – 130
Frequency	4	10	14	12	8	6

**(ii)** Draw a Multiplt Bar Diagram for the regional percentage of viewers for a popular T.V. serial on D.D. Metro for 3 months. **(7)**

Months	North	South	West	East
April	40	45	32	25
May	50	55	40	30
June	45	49	38	38

**OR**

**(B) (i)** Request the following data by a Histogram and a Frequency Curve **(plot on the same graph)** **(8)**

Units	0 – 200	200 – 400	400 – 600	600 – 800	800 – 1000	1000 - 1200
No of Consumers	9	18	27	35	28	11

**(ii)** Find the missing frequency is the mean is 21.9 **(7)**

Class	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40
Frequency	2	5	----	13	21	16	8	3

**P.T.O.**

**Q.3. Attempt either (A) or (B):****(A) (i)** Calculate Karl Pearson's Co-efficient of correlation for the following data: **(7)**

<b>X</b>	<b>17</b>	<b>8</b>	<b>12</b>	<b>13</b>	<b>10</b>	<b>12</b>
<b>Y</b>	13	7	10	11	8	9

**(ii)** Calculate Mean Deviation from Mean and its co-efficient for the following data: **(8)**

<b>Age</b>	<b>20 - 22</b>	<b>22 - 24</b>	<b>24 - 26</b>	<b>26 - 28</b>	<b>28 - 30</b>	<b>30 - 32</b>	<b>32 - 34</b>
<b>No. of Employees</b>	70	90	110	140	130	80	80

**OR****(B) (i)** Find the regression equation of x on y for the following data and hence estimate x when y = 15.

<b>X</b>	<b>10</b>	<b>12</b>	<b>14</b>	<b>19</b>	<b>8</b>	<b>11</b>	<b>17</b>
<b>Y</b>	20	24	25	21	16	22	20

**(ii)** Calculate rank correlation co-efficient from the following data representing marks in Maths (X) and Accountancy (Y). **(7)**

<b>X</b>	<b>15</b>	<b>11</b>	<b>7</b>	<b>9</b>	<b>8</b>	<b>5</b>	<b>13</b>
<b>Y</b>	12	10	5	7	6	4	9

**Q.4. Attempt either (A) or (B):****(A) (i)** Fit a trend line by the method of least squares and estimated the trend for the year 2009. **(10)**

<b>Year</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Export in lakhs in Rupees	8	10	12	11	13	15	14	17	17

**(ii)** Calculate Chain Base Index Number for the following data. **(5)**

<b>Year</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
<b>Price</b>	35	39	27	32	41

**OR****(B) (i)** Calculate Laspeyre's, Paasche's and Fisher's index number for the following data. **(8)**

<b>Commodity</b>	<b>Base Year</b>		<b>Current Year</b>	
	<b>Price</b>	<b>Quantity</b>	<b>Price</b>	<b>Quantity</b>
Rice	4	15	5	20
Pulses	8	20	12	30
Sugar	6	25	8	20
Oil	14	10	21	15

**P.T.O.**

(ii) Calculate 3 Yearly Moving Averages for the following time series. (7)

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sales	53.6	48.4	45.6	51.2	46.8	42.5	40.7	45.1	39.6	38.8

**Q.5. Attempt either (A) or (B):**

(A) 1. A box contains 5 blue and 4 red balls. 4 balls are selected at random from the box. Find the probability that (i) exactly 3 red balls are selected (ii) at least three red balls are selected. (5)

2. For the following payoff table, find the optimal decision using (i) Maximin criterion (ii) Maximax criterion (iii) Laplace criterion (iv) Minimax Regret Criterion. (10)

Course of Action	State of Nature		
	$S_1$	$S_2$	$S_3$
$A_1$	35	100	38
$A_2$	58	95	105
$A_3$	45	30	91

**OR**

(B) Attempt any three:

1. Distinguish between Primary and Secondary Data. (5)
2. Explain the following terms: (i) Experiment (ii) Sample Space (iii) Exhaustive Events (iv) Independent Events (v) Complementary Events. (5)
3. Write short Notes on: (i) Wholesale Price Index (ii) Family Budget Method. (5)
4. Define for a random variable (i) Expectation (ii) Variance. (5)
5. What is a time series? Describe the various components of a time series with suitable examples. (5)

\*\*\*\*\*

**F.Y.B.M.S**  
**Sem - I**

**Business Statistic Test:**  
**(Solution)**

**Marks:- 75**  
**Time:- 2 ½ hrs.**

1. (A) (1) Primary data (2) Mode (3) Median (4) less (5) x increases as y increases  
(6) Time series (7) always (8) discrete (9) sample point (10) uncertainty

1. (B) True : 1, 2, 6, 8; False : 3, 4, 5, 7, 9, 10

2. (A) (i)

Class	Frequency	Cumulative Frequency
10-30	4	4
30-50	10	14
50-70	14	28
70-90	12	40
90-110	8	48
110-130	6	54

For **median**, here  $N = \Sigma f = 54$ ,  $\frac{N}{2} = 27$ .

So 50 – 70 is the median class as 28 > 27.

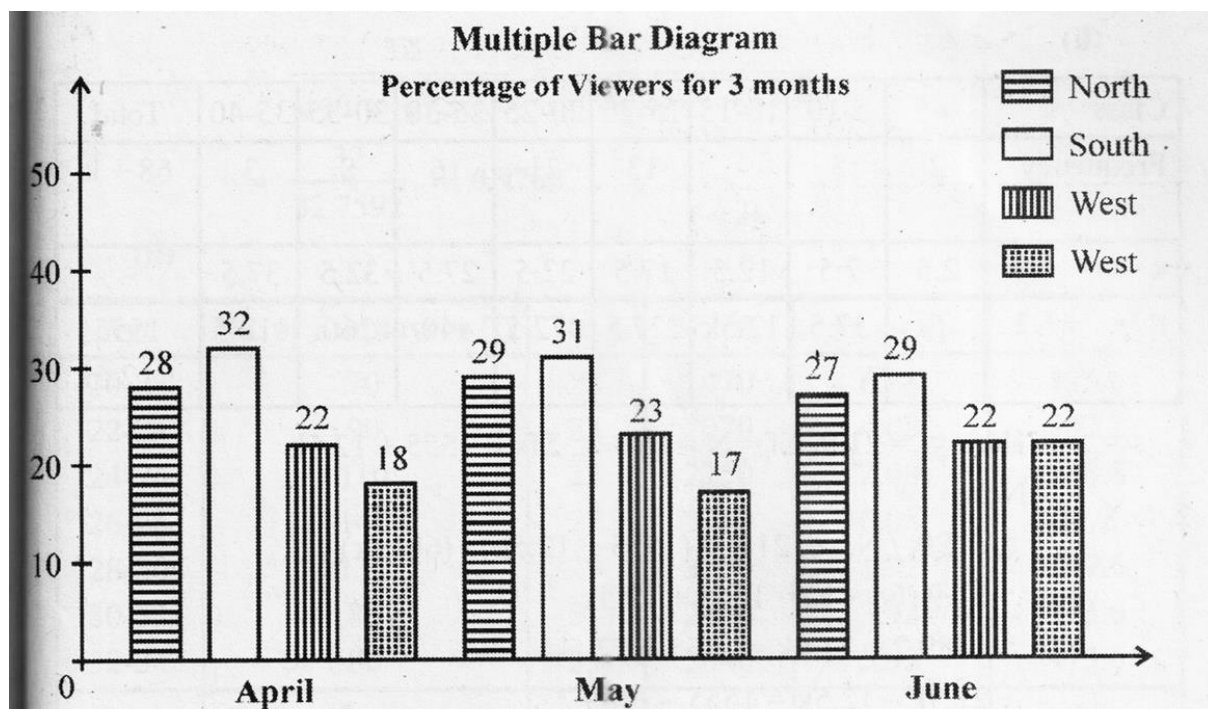
$$\begin{aligned} \text{Median} &= l_1 + (l_2 - l_1) (N/2 - c.f.) / f \\ &= 50 + 20 \times (27 - 14) / 14 = 50 + 18.57 = \mathbf{68.57} \end{aligned}$$

For Mode, as **maximum frequency** is **14**, the modal class is **50-70**.

$$\begin{aligned} \text{Mode} &= l_1 + (l_2 - l_1) (f_1 - f_0) / (2f_1 - f_0 - f_2) \\ &= 50 + 20 \times (14 - 10) / (2 \times 14 - 10 - 12) \\ &= 50 + 13.33 = \mathbf{63.33} \end{aligned}$$

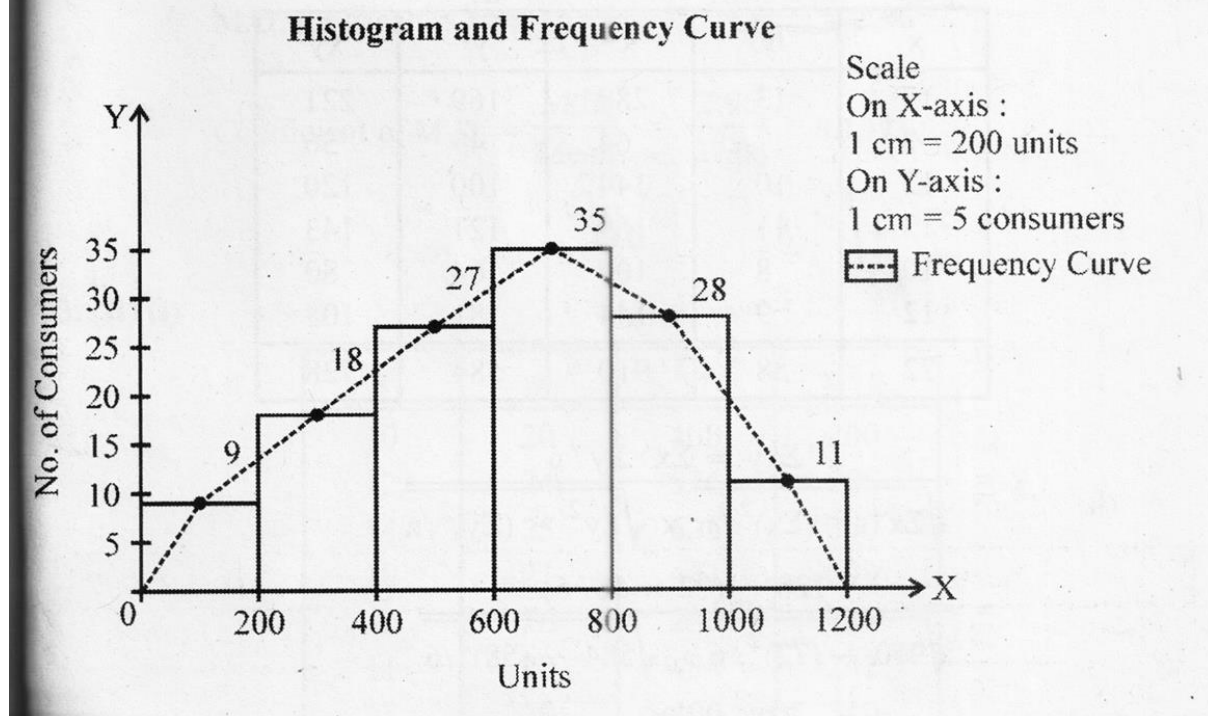
- (ii) Find percentage of viewers for 3 months as follows :

	North (%)	South (%)	West (%)	East (%)	Total
April	40 (28)	45 (32)	32 (22)	25 (18)	142 (100%)
May	50 (29)	55 (31)	40 (23)	30 (17)	175 (100%)
June	45 (27)	49 (29)	38 (22)	38 (22)	170 (100%)



OR

2. (B) (i)



(ii)

Class	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	Total
Frequency	2	5	- (k)	13	21	16	8	3	68 + k
x	2.5	7.5	12.5	17.5	22.5	27.5	32.5	37.5	-
f · x	5	37.5	12.5k	227.5	472.5	440	260	112.5	1555 + 12.5k

Here  $\bar{x} = 21.9$ ,  $\Sigma f = N = 68 + k$ ,  $\Sigma fx = 1555 + 12.5k$

Now,

$$\bar{x} = \Sigma fx / N, \text{ so, } 21.9 = (1555 + 12.5k) / (68 + k)$$

$$\therefore 21.9 (68 + k) = 1555 + 12.5k$$

$$\therefore 1489.2 + 21.9k = 1555 + 12.5k$$

$$\therefore 21.9k - 12.5k = 1555 - 1489.2$$

$$\therefore 9.4k = 65.8, k = 65.8 / 9.4 = 7$$

So, missing frequency is 7.

3. (A) (i)

x	y	$x^2$	$y^2$	xy
17	13	289	169	221
8	7	64	49	56
12	10	144	100	120
13	11	169	121	143
10	8	100	64	80
12	9	144	81	108
72	58	910	584	728

$$\begin{aligned} r &= \frac{\Sigma xy = \Sigma x \cdot \Sigma y / n}{\sqrt{\Sigma x^2 - (\Sigma x)^2 / n} \times \sqrt{\Sigma y^2 - (\Sigma y)^2 / n}} \\ &= \frac{728 - (72 \times 58 / 6)}{\sqrt{910 - (72)^2 / 6} \times \sqrt{584 - (58)^2 / 6}} \\ &= \frac{728 - 696}{\sqrt{910 - 864} \times \sqrt{584 - 560.67}} \end{aligned}$$

$$= \frac{32}{\sqrt{46} \times \sqrt{23.33}} = \frac{32}{6.7823 \times 4.8301}$$

$$= \frac{32}{32.7592} = 0.9768$$

(ii)

Age	No. of Employees (f)	x	f · x	x - $\bar{x}$	f ·  x - $\bar{x}$
20-22	70	21	1470	6.08	425.6
22-24	90	23	2070	4.08	367.2
24-26	110	25	2750	2.08	228.8
26-28	140	27	3780	0.08	11.2
28-30	130	29	3770	1.92	249.6
30-32	80	31	2480	3.92	313.6
32-34	80	33	2640	5.92	473.6
Total	700		18960		2069.6

$$\bar{x} = \Sigma fx / \Sigma f = 18960 / 700 = 27.0857 = 27.08$$

$$\text{M.D. for Mean} = \frac{\Sigma f \cdot |x - \bar{x}|}{\Sigma f} = \frac{2069.6}{700} = 2.96$$

$$\text{Coefficient of M.D.} = \frac{\text{M.D.}}{\text{Mean}} = \frac{2.96}{27.08} = 0.1093$$

OR

3. (B) (i)

x	y	y <sup>2</sup>	x · y
10	20	400	200
12	24	576	288
14	25	625	350
19	21	441	399
8	16	256	128
11	22	484	242
17	20	400	340
91	148	3182	1947



Here  $\bar{x} = 91/7 = 13$ ,  $\bar{y} = 148/7 = 21.14$

$$\begin{aligned} b_{xy} &= (\Sigma xy - \Sigma x \times \Sigma y / n) / (\Sigma y^2 - (\Sigma y)^2 / n) \\ &= (1947 - 91 \times 148 / 7) / (3182 - (148)^2 / 7) \\ &= (1947 - 1924) / (3182 - 3129.14) \\ &= 23 / 52.86 = \mathbf{0.4351} \end{aligned}$$

Regression equation of x on y is

$$x - \bar{x} = b_{xy} (y - \bar{y}), \text{ substituting,}$$

$$x - 13 = 0.4351 (y - 21.14)$$

To estimate x, put  $y = 15$ , in the above equation.

$$x - 13 = 0.4351 (15 - 21.14) = 0.4351 \times (-6.14) = -2.67$$

$$\therefore x = 13 - 2.67 = \mathbf{10.33}$$

(ii)

x	y	$R_1$	$R_2$	$d = R_1 - R_2$	$d^2$
15	12	7	7	0	0
11	10	5	6	-1	1
7	5	2	2	0	0
9	7	4	4	0	0
8	6	3	3	0	0
5	4	1	1	0	0
13	9	6	5	1	1
Total					2

Here  $n = 7$ ,  $\Sigma d^2 = 2$

$$\begin{aligned} R &= 1 - \frac{6\Sigma d^2}{n(n^2 - 1)} \\ &= 1 - (6 \times 2) / [7 \times (49 - 1)] \\ &= 1 - [12 / (7 \times 48)] \\ &= 1 - 12 / 336 \\ &= 1 - 0.0357 = \mathbf{0.9643} \end{aligned}$$

4. (A) (i)

Year	Exports (y)	x	x <sup>2</sup>	x · y	Trend values
1999	8	-4	16	-32	8.67
2000	10	-3	9	-30	9.75
2001	12	-2	4	-24	10.83
2002	11	-1	1	-11	11.91
2003	13	0	0	0	12.99
2004	15	1	1	15	14.07
2005	14	2	4	28	15.15
2006	17	3	9	51	16.23
2007	17	4	16	68	17.31
Total	117		60	65	

Here  $a = \bar{y} = 117/9 = 13$

$$b_{yx} = \Sigma xy / \Sigma x^2 = 65 / 60 = 1.0833$$

The trend line is  $y = a + bx = 13 + 1.0833x$

To find trend values, put  $x = -4$ , in the above equation

$$y = 13 + 1.0833(-4) = 13 - 4.3332 = 8.6668 = 8.67$$

For remaining trend values, go on adding

$b = 1.0833 = 1.08$ , to previous trend values.

Estimate for 2008 is  $y = 17.31 + 1.08 = 18.39$

Estimate for 2009 is  $y = 18.39 + 1.08 = 19.47$

(ii)

Year	Prices	Link Relatives	Chain Base Index
2002	35	100	100
2003	39	$(39/35) \times 100 = 111.43$	$111.43 \times 100/100 = 111.43$
2004	27	$(27/39) \times 100 = 69.23$	$69.23 \times 111.43/100 = 77.14$
2005	32	$(32/27) \times 100 = 118.52$	$118.52 \times 77.14/100 = 91.43$
2006	41	$(41/32) \times 100 = 128.13$	$128.13 \times 91.43/100 = 117.15$

OR

4. (B) (i)

Commodity	Base Year		Current Year					
	Price	Qty.	Price	Qty.				
	$P_0$	$Q_0$	$P_1$	$Q_1$	$P_1Q_0$	$P_0Q_1$	$P_1Q_1$	$P_0Q_1$
Rice	4	15	5	20	75	60	100	80
Pulses	8	20	12	30	240	160	360	240
Sugar	6	25	8	20	200	150	160	120
Oil	14	10	21	15	210	140	315	210
Total	-	-	-	-	725	510	935	650

$$\text{Laspeyre's Index No.} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100 = \frac{725 \times 100}{510} = 142.1569$$

$$\text{Paasche's Index No.} = \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \times 100 = \frac{935 \times 100}{650} = 143.8462$$

$$\text{Fisher's Index No.} = \sqrt{142.1569 \times 143.8462} = 142.9991$$

(ii)

Year	Sales	3 Yearly Moving Total	Moving = Total/3
1996	53.6	-	-
1997	48.4	53.6 + 48.4 + 45.6 = 147.6	49.2
1998	45.6	48.4 + 45.6 + 51.2 = 145.2	48.4
1999	51.2	45.6 + 51.2 + 46.8 = 143.6	47.9
2000	46.8	51.2 + 46.8 + 42.5 = 140.5	46.8
2001	42.5	46.8 + 42.5 + 40.7 = 130	43.3
2002	40.7	42.5 + 40.7 + 45.1 = 128.3	42.8
2003	45.1	40.7 + 45.1 + 39.6 = 125.4	41.8
2004	39.6	45.1 + 39.6 + 38.8 = 123.5	41.2
2005	38.8	-	-

5. (A) (i) Probability of exactly 3 red balls = Probability of 3 red, 1 blue balls

$$= \frac{{}^4C_3 \times {}^5C_1}{{}^9C_4} = \frac{4 \times 5}{(9 \times 8 \times 7 \times 6 / 4 \times 3 \times 2 \times 1)}$$

$$= \frac{20}{126} = 0.1587$$

$$\text{Probability of 4 red balls} = {}^4C_4 / {}^9C_4 = 1/126 = 0.0079$$

Probability at least 3 red balls

= Probability of 3 red balls + Probability of 4 red balls

=  $0.1587 + 0.0079 = 0.1666$

(ii)

Course of Action	State of Nature		
	$S_1$	$S_2$	$S_3$
$A_1$	35	100	38
$A_2$	58	95	105
$A_3$	45	30	91

(i) **Maximin Criterion**

For  $A_1$ , min is **35**, for  $A_2$ , min is **58**, for  $A_3$ , min is **30**.

Now maximum of (35, **58**, 30) is **58**. So choose action  $A_2$ .

(ii) **Maximax Criterion**

For  $A_1$ , max is **100**, for  $A_2$ , max is **105** and for  $A_3$ , max is **91**

Now, max (100, **105**, 91) is **105**.

So, choose action  $A_2$ .

(iii) **Laplace Criterion**

For  $A_1$ , average pay-off =  $(35 + 100 + 38) / 3 = 57.67$

For  $A_2$ , average pay-off =  $(58 + 95 + 105) / 3 = 86$

For  $A_3$ , average pay-off =  $(45 + 30 + 91) / 3 = 55.33$

As, maximum average pay-off is **86**, choose action  $A_2$ .

(iv) **Minimax Regret Criterion**

For  $S_1$ , max pay-off is **58**

For  $S_2$ , max pay-off is **100**

For  $S_3$ , max pay-off is **105**

Regret values for  $S_1$  :  $58-35, 58-58, 58-45 = 23, 0, 13$

Regret values for  $S_2$  :  $100-100, 100-95, 100-30 = 0, 5, 70$

Regret values for  $S_3$  :  $105-38, 105-105, 105-91 = 67, 0, 14$

The Regret Table is as follows :

Course of Action	State of Nature		
	$S_1$	$S_2$	$S_3$
$A_1$	23	0	67
$A_2$	0	5	0
$A_3$	13	70	14

For  $A_1$ , max regret is 67

For  $A_2$ , max regret is 5

For  $A_3$ , max regret is 70

Now minimum of (67, 5, 70) is 5.

Hence choose **action  $A_2$** , with minimum **value 5**.

- 5. (B) (i) Primary and Secondary Data : Refer Chapter 1, Pgs. 6 to 10**
- (ii) Experiment, Sample Space, Exhaustive Events, Independent Events, Complementary Events : Refer Chapter 9, Pgs. 283, 285, 296 and 284**
- (iii) Wholesale Price Index and Family Budget Method : Refer Chapter 8, Pgs. 258 and 255**
- (iv) Expectation, Variance of a Random Variable : Refer Chapter 9, Pgs. 306-307 and 310-311**
- (v) Time Series and Its Components : Refer Chapter 7, Pgs. 221-223**

\*\*\*\*\*