

# Final Paper

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Course = MBA-90

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(Part - I)

Q1,-

i) (a)  $1/8$

ii) (b)  $1/3$

iii) (a) 1

iv) (a)  $S = \sum Y^2 - a \sum Y - b \sum XY$

v) (b)  $aE(X) + b$

vi) (d) None of above

vii) (c) 4 — Probability cannot be greater than 4

viii) a) -10

ix) (c)  $3/4$

x) (a)  $P(A) + P(B)$

(Part II)

Q2.

$$f(x) = \frac{3}{4}(3-x)(x-5), \quad 3 \leq x \leq 5$$

Find variance, S.D

Solution:-

$$f(x) = \frac{3}{4}(3-x)(x-5), \quad 3 \leq x \leq 5$$

$$= \frac{3}{4}(3x - 15 - x^2 + 5x)$$

$$= \frac{3}{4}(-x^2 + 8x - 15)$$

$$\text{Variance} = E(x^2) - \{E(x)\}^2$$

$$E(x) = \int_{-\infty}^{\infty} x f(x) dx$$

$$= \frac{3}{4} \int_3^5 x(-x^2 + 8x - 15) dx$$

$$= -\frac{3}{4} \int_3^5 x^3 dx + \frac{3}{4} \int_3^5 8x^2 dx - \frac{3}{4} \times 15 \int_3^5 x dx$$

$$= -\frac{3}{4} \cdot \frac{x^4}{4} \Big|_3^5 + \frac{3}{4} \times 8 \frac{x^3}{3} \Big|_3^5 - \frac{3}{4} \times 15 \frac{x^2}{2} \Big|_3^5$$

$$\text{or } = -\frac{3}{16} \cdot x^4 \Big|_3^5 + 2 \cdot x^3 \Big|_3^5 - \frac{45}{8} x^2 \Big|_3^5$$

$$\Rightarrow -\frac{3}{16} \left\{ (5)^4 - (3)^4 \right\} + 2 \left\{ (5)^3 - (3)^3 \right\} - \frac{45}{8} \left\{ (5)^2 - (3)^2 \right\}$$

$$\Rightarrow -\frac{3}{16} (625 - 81) + 2 (125 - 27) - \frac{45}{8} (25 - 9)$$

$$= -\frac{3}{16} (544) + 2 (98) - \frac{45}{8} (16)$$

$$= -3 (34) + 2 (98) - 45 \times 2$$

$$= -102 + 196 - 90$$

$$= E(x) = 4$$

$$E(x^2) = \int_{-\infty}^{\infty} x^2 f(x) dx$$

$$= \frac{3}{4} \int_3^5 x^2 (-x^2 + 8x - 15) dx$$

$$= \frac{3}{4} \int_3^5 (-x^4 + 8x^3 - 15x^2) dx$$

$$= -\frac{3}{4} \int_3^5 x^4 dx + \frac{3}{4} \times 8 \int_3^5 x^3 dx - \frac{3}{4} \times 15 \int_3^5 x^2 dx$$

$$= -\frac{3}{4} \frac{x^5}{5} \Big|_3^5 + 6 \frac{x^4}{4} \Big|_3^5 - \frac{45}{4} \frac{x^3}{3} \Big|_3^5$$

$$= \frac{-3}{20} \{ (5)^5 - (3)^5 \} + \frac{6}{4} \{ (5)^4 - (3)^4 \} - \frac{45}{12} \{ (5)^3 - (3)^3 \}$$

$$= \frac{-3}{20} (2882) + \frac{6}{4} (544) - \frac{45}{12} (98)$$

$$= - \frac{4323}{10} + 6 \times (136) - \frac{45}{6} \times (49)$$

$$= \frac{-4323}{10} + \frac{816}{1} - \frac{2205}{6}$$

$$= \frac{-12969 + 24480 - 11625}{30}$$

$$= \frac{486}{30}$$

$$E x^2 = \frac{81}{5}$$

$$\text{Var}(x) = E x^2 - \{ E(x) \}^2$$

$$= \frac{81}{5} - (4)^2$$

$$= \frac{81}{5} - 16$$

$$= \frac{81-80}{5} \Rightarrow \frac{1}{5} = 0.2$$

$$\text{S.D} \sqrt{\text{Var}(x)}$$

$$= \sqrt{0.2}$$

$$\Rightarrow \sqrt{0.2} \Rightarrow 0.44$$

Q<sup>3</sup> Show that

(a)

$$(A \cup B)^c = (A^c \cap B^c)$$

Proof:- we have Prove that

$$\text{If } U = \{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23\}$$

$$A = \{3, 6, 9, 12, 15, 18\}$$

$$B = \{10\}$$

$$C = \{3, 6, 9, 12, 15, 18\}$$

then

$$(A \cup B)^c = A^c \cap B^c$$

L. H. S  $\Rightarrow$

$$(A \cup B)^c = U / (A \cup B)$$

$$= \{1, 3, 5, 7, \dots, 23\} / \{3, 6, 9, 12, 15, 18\} \cup \{10\}$$

$$= \{1, 3, 5, 7, \dots, 23\} / \{3, 6, 9, 10, 12, 15, 18\}$$

$$(A \cup B)^c = \{1, 5, 11, 13, 17, 19, 21, 23\} \text{ --- i}$$

R.H.S  $\Rightarrow$

$$A^c = U/A$$

$$= \{1, 3, 5, \dots, 23\} / \{3, 6, 9, 12, 15, 18\}$$

$$= \{1, 5, 7, 11, 13, 17, 19, 21, 23\}$$

$$B^c = U/B$$

$$= \{1, 3, 5, \dots, 23\} / \{10\}$$

$$= \{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23\}$$

$$A^c \cap B^c = \{1, 5, 11, 13, 19, 21, 23\} \text{ --- ii)}$$

So from eq(i) and eq(ii)

$$L.H.S = R.H.S$$

$$(A \cup B)^c = A^c \cap B^c$$

Hence Proved

$$\text{ii) } A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

Proof

we have to Prove that

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

L. H. S  $\Rightarrow$

$$\begin{aligned} A \cap (B \cup C) &= \{3, 6, 9, 12, 15, 18\} \cap [\{10\} \cup \{3, 6, 9, 12, 15, 17\}] \\ &= \{3, 6, 9, 12, 15, 18\} \cap \{3, 6, 9, 10, 12, 15, 17\} \\ &= \{3, 6, 9, 12, 15, 18\} \text{ — (i)} \end{aligned}$$

R. H. S  $\Rightarrow$

$$\begin{aligned} (A \cap B) \cup (A \cap C) &= [\{3, 6, 9, 12, 15, 18\} \cap \{10\}] \cup [\{3, 6, 9, 12, 15, 18\} \\ &\quad \cap \{3, 6, 9, 12, 15, 18\}] \\ &= \{ \} \cup \{3, 6, 9, 12, 15, 18\} \end{aligned}$$

$$= \{3, 6, 9, 12, 15, 18\} \text{ — ii}$$

From eq (i) and eq (ii)

$$\text{L. H. S} = \text{R. H. S}$$

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

Hence Proved



Solution:-

$x$	$Y$	$xY$	$x^2$
5	16	80	25
6	19	114	36
8	23	184	64
10	28	280	100
12	36	432	144
13	41	533	169
15	44	660	225
16	45	720	256
17	50	850	289
<u>102</u>	<u>302</u>	<u>3853</u>	<u>1308</u>

$$\hat{Y} = a + bx$$

$$a = \bar{Y} - b\bar{x}$$

$$b = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}}$$

$$\bar{x} = \frac{\sum x}{n}$$

$$= \frac{3853 - \frac{(102)(302)}{9}}{1308 - \frac{(102)^2}{9}}$$

$$= \frac{102}{9} \Rightarrow \underline{\underline{11.33}}$$

$$= \frac{3853 - 3422.6}{1308 - 1156} \Rightarrow \frac{430.4}{152}$$

$$= 2.83$$

$$\bar{Y} = \frac{\sum Y}{n}$$

$$= \frac{302}{9}$$

$$= 33.5$$

$$\bar{Y} = 33.5$$

$$\bar{X} = 11.33$$

$$b = 2.83$$

$$a = 33.5 - 11.33(2.83)$$

$$= 33.5 - 32.064$$

$$= 1.4361$$

$$\hat{Y} = 1.4361 + 2.83X$$

The estimated regression coefficient is  $b = 2.83$ , which indicates that the value of  $Y$  increase by  $2.83$ /unit for a unit increase in  $X$ .

# Question # 5

## Solution :-

<u>No</u>	<u>X</u>	<u>log X</u>
1	9	0.9542
2	12	1.0792
3	15	1.1761
4	15	1.1761
5	16	1.2041
6	18	1.2553
7	20	1.3010
8	20	1.3010
9	25	1.3979
10	<u>30</u>	<u>1.4771</u>
	179	12.331

$$\begin{aligned} \text{G.M} &= \text{Antilog} \left( \frac{\sum \log x}{n} \right) \\ &= \text{Antilog} \left( \frac{12.331}{10} \right) \\ &\Rightarrow \text{Antilog} (1.2322) \end{aligned}$$

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$$\text{Ans} \Rightarrow \text{Anti Log}(1.2322) \\ = 17.06$$

$$\text{Median} = \left(\frac{n+1}{2}\right)^{\text{th}} \text{ item} \\ = \left(\frac{11}{2}\right)^{\text{th}} \text{ item} \\ = 5.5^{\text{th}} \text{ item}$$

$$= \frac{5^{\text{th}} \text{ item} + 6^{\text{th}} \text{ item}}{2}$$

$$= \frac{16 + 18}{2}$$

$$= \frac{34}{2}$$

$$\text{Median} = 17$$

Mode = 20 and 15  
(Most repeated values)

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