IQRA NATIONAL UNIVERSITY OF IT & EMERGING SCIENCES
PESHAWAR

MBA

Business Mathematics and Statistics

Time: 3PM ***Summer Semester –Final Term*** ***Total Marks: 50***

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Time 1Hrs:. **(Part –I)** **Marks 10**

Q 1

i When 3 balanced coins are tossed and X be a random variable that denotes the number of heads then $f(0) =$

(a) $1/8$ (b) $3/8$ (c) 1 (d) 0 (e) None of them

ii Let X be a continuous random variable and $f(x) = x,\ 0 \le x \le 1,\ f(x) = 0$ otherwise, then $E(X) =$ (a) -1/3 (b) 1/3 (c) 1/2 (d) 2/3 (e) None of them

iii If $E(X) = 2$ and $E(X^2) = 5$, then $V(X) =$ (a) 1 (b) 2 (c) 3(d) 21 (e)None of them

iv The sum of squares of residuals for a straight line is

(a) $S = \sum Y^2 - a\sum Y - b\sum XY$ (b) $S = \sum Y^2 + a\sum Y + b\sum XY$ (c) $S = \sum XY + a\sum Y + b\sum X$ (d) None of above

v The value of $E(aX + b) =$ (a) $a^2E(X) + b$ (b) $aE(X) + b$ (c) $a^2E(X)$ (d) none of above

vi The variation of the Y values around the regression line is measured by

(a) $\sum(Y - \bar{Y})^2$ (b) $\sum(Y - \hat{Y})^2$ (c) $\sum(\hat{Y} - \bar{Y})^2$ (d) None of above

vii If , $P(A) = 2$ and $P(A \cap B) = 8$ then $P(B/A) =$ (a) 10 (b) 1/4 (c) 4 (d) 2 (e) None .

viii A random variable X is normally distributed with $\mu = 50$, $\sigma^2 = 25$ and . $x = 0$ the value of standardized $z =$ (a) -10(b) 10 (c) 1 (d) None of them

ix If a fair coin is tossed two times then the probability of at least one head appears is

(a) 1/4(b) 2/4(c) 3/4(d) None

x If A and B are mutually exclusive events then $P(A \cup B) =$

(a) $P(A) + P(B)$ (b) $P(A) + P(B) - P(A \cap B)$ (c) $P(A)/P(A \cap B)$ (d) None

Q ③

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

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

$B = \{5, 10\}$

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

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

$A \cup B = \{3, 6, 9, 12, 15, 18\} \cup \{5, 10\}$

$= \{3, 5, 6, 9, 10, 12, 15, 18\}$

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

$\{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21\} - \{3, 5, 6, 9, 10, 12, 15, 18\}$

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

$A^c = U - A$

$= \{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21\} - \{3, 6, 9, 12, 15, 18\}$

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

$B^c = U - B$

$\{1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21\} - \{5, 10\}$

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

(2)

a) $A^c \cap B^c$

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

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

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

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

$B \cup C = \{5,10\} \cup \{3,6,9,12,15,18\}$

$= \{3,5,6,9,10,12,15,18\}$

$A \cap B \cup C = \{3,6,9,12,15,18\} \cap \{3,5,6,9,10,12,15,18\}$

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

$A \cap B = \{3,6,9,12,15,18\} \cap \{5,10\} = \{\}$

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

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

$(A \cap B) \cup (A \cap C) = \{3,6,9,12,15,18\}$

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

Q(5).

x	$\log x$
9	0.9542
12	1.0792
15	1.1761
15	1.1761
16	1.2041
18	1.2553
20	1.3010
20	1.3010
25	1.3979
30	1.4771
$\Sigma x = 180$	$\Sigma \log x = 12.324$

$$\text{Mean} = \frac{\Sigma x}{n} = \frac{180}{10} = \boxed{18}$$

$$\text{Median} = \frac{1}{2}\left[\frac{n}{2}, \frac{n}{2}+1\right]^{th}$$

$$= \frac{1}{2}\left[\frac{10}{2}, \frac{10}{2}+1\right]^{th}$$

$$= \frac{1}{2}[5, 6]^{th}$$

$$\text{Median} = \frac{1}{2}[16, 18] = \frac{16+18}{2} = \frac{34}{2} = \boxed{17}$$

$$\text{G.M} = \text{antilog}\ \frac{\Sigma \log x}{n}$$

$$\text{G.M} = \text{antilog}\ \frac{12.324}{10}$$

$$\text{G.M} = \text{antilog}\ 1.2324$$

$$\boxed{\text{G.M.}\ 17.08}$$

② Sol. $f(x) = \frac{3}{4}(3-x)(x-5) \quad 3 \le x \le 5$

$= 0$ elsewhere

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

$= \frac{3}{4}\int_{3}^{5} x\cdot(3-x)(x-5)\,dx$

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

$= \frac{3}{4}\left[-\frac{x^4}{4}+\frac{8x^3}{3}-\frac{15x^2}{2}\right]_3^5$

$= \frac{3}{4}\left[\left(-\frac{625}{4}+\frac{1000}{3}-\frac{375}{2}\right)-\left(-\frac{81}{4}+\frac{216}{3}-\frac{135}{2}\right)\right]$

$= \frac{3}{4}\left[-\frac{125}{12}+\frac{63}{4}\right] = \frac{3}{4}\left(\frac{64}{12}\right) = 4$

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

$E(X^2) = \frac{3}{4}\int_{3}^{5} x^2(3-x)(x-5)\,dx$

$E(X^2) = \frac{3}{4}\int_{3}^{5} (-x^4+8x^3-15x^2)\,dx$

$E(X^2) = \frac{3}{4}\left[-\frac{x^5}{5}+\frac{8x^4}{4}-\frac{15x^3}{3}\right]_3^5$

$E(X^2) = \frac{3}{4}\left[-\frac{1}{5}(3125)+2(625)-5(125)-\left\{-\frac{1}{5}(243)+2(81)-5(27)\right\}\right]$

$= \frac{3}{4}\left[0+\frac{243}{5}-162+135\right] = \frac{3}{4}\left[\frac{108}{5}\right] = \frac{81}{5}$

$Var(X) = E(X^2)-(E(X))^2$

$= \frac{81}{5}-(4)^2 = \frac{81}{5}-16 = \frac{1}{5} = 0.2$

$S.D(X) = \sqrt{0.2} = 0.447$

Q(iv) Sol.

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
$\Sigma x = 102$	$\Sigma y = 302$	$\Sigma xy = 3853$	$\Sigma x^2 = 1308$

Regression Equation Y on X

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

$$b_{y/x} = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{n\Sigma x^2 - (\Sigma x)^2}$$

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

$$b_{y/x} = \frac{34677 - 30804}{11772 - 10404}$$

$$b_{y/x} = \frac{3873}{1368} = 2.83$$

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

$$\bar{x} = \frac{102}{9} = 11.33$$

$$\bar{y} = \frac{\Sigma y}{n} = \frac{302}{9}$$

$$\bar{y} = 33.55$$

$$a = \bar{y} - b_{y/x}\bar{x}$$

$$a = 33.55 - (2.83)(11.33)$$

$$a = 33.55 - 32.06$$

$$a = 1.49$$

$$\boxed{\hat{y} = 1.49 + 2.83x}$$

The estimated regression co-efficient $b = 2.83$, which indicates that the values of y increase by 2.83 unit for a unit increase in x.

$\Sigma x = 102$