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CMRIT — CMR INSTITUTE OF TECHNOLOGY, BENGALURU. ACCREDITED WITH A+ GRADE BY NAAC. CELEBRATING 25 YEARS

Internal Assessment Test I – April 2019

Sub	Discrete Mathematics and Statistics					Sub Code	18MCA23		
Date	16th April 2019	Duration	90 mins	Max Marks	50	Sem / Sec	II MCA	OBE	

Q1 is compulsory Answer any six from Q2to Q8

	MARKS	CO	RBT
1,Fit a parabola for the given data	[08]	CO4	L3

Year	1961	1971	1981	1991	2001
Production	8	10	12	10	16

(Or)

2.Fit an exponential curve $y = ae^{bx}$ for the given data.

x	0	2	4
y	5.02	10	31.62

3.A coin is tossed 3 times. Let X denote the number of heads showing up. Find the distribution of X. Also find its mean, variance and standard deviation.	[07]	CO3	L3

(Or)

3.Given the equations of regression lines 8x-10y+66 = 0 and 40x - 18y = 214 . Find the mean of x and y series and the correlation co-efficient. Find S.D of y if S.D of x is 3.	[07]	CO4	L3

(Or)

When a coin is tossed 6 times, using binomial distribution, find the probability of getting a) exactly one head b) at most 3 heads c) at least 3 heads.	[07]	CO3	L3

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$8x - 10y - 66 = 0$ — (1)

$40x - 18y - 214 = 0$ — (2)

$4x - 5y = 33$ — (1)

$20x - 9y = 107$ — (2)

(1) × 5 − (2)

$20\bar{x} - 25\bar{y} = 165$

$20\bar{x} - 9\bar{y} = 107$

regression lines pass thro' $(\bar{x}\ \bar{y})$

$-16\bar{y} = 58$

$\bar{y} = -\frac{58}{16}$ or $\frac{-29}{8}$

(1) is $4\bar{x} - 5\bar{y} = 33$

$4\bar{x} - 5\left(-\frac{29}{8}\right) = 33$

$4\bar{x} + \frac{145}{8} = 33$

$32\bar{x} + 145 = 33 \times 8$

$32\bar{x} + 145 = 264$

$32\bar{x} = 264 - 145 = 119$

$\bar{x} = \frac{119}{32}$

$(\bar{x}\ \bar{y}) = \left(\frac{119}{32}, -\frac{29}{8}\right)$

$n = 6 \quad p = \frac{1}{2} \quad q = 1 - p = 1 - \frac{1}{2} = \frac{1}{2}$

$b(n, p, x) = {}^{n}C_x \, p^x \, q^{n-x} \quad x = 0, 1, 2 \ldots n$

$b\left(6, \frac{1}{2}, x\right) = {}^{6}C_x \left(\frac{1}{2}\right)^x \left(\frac{1}{2}\right)^{6-x} \quad x = 0 \text{ to } 6$

$P(1 \text{ head}) = P(x = 1) = {}^{6}C_1 \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^{6-1}$

$= 6 \left(\frac{1}{2}\right)\left(\frac{1}{2^5}\right) = \frac{6}{2^6} = \frac{6}{64}$

$= \frac{3}{32}$

$P(\text{at most 3 heads}) = P(x \leq 3)$

$= P(x=0) + P(x=1) + P(x=2) + P(x=3)$

$= {}^{6}C_0 \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^{6-0} + {}^{6}C_1 \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{6-1} + {}^{6}C_2 \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^{6-2}$

$+ {}^{6}C_3 \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^{6-3}$

$= \frac{1}{2^6} + 6 \cdot \frac{1}{2^6} + 15 \frac{1}{2^6} + 20 \frac{1}{2^6}$

$= \frac{42}{2^6} = \frac{42}{64} = \frac{21}{32}$

$P(\text{at least 3 heads}) = P(x \geq 3)$

$= 1 - P(x < 3)$

$= 1 - \left\{ P(x=0) + P(x=1) + P(x=2) \right\}$

$= 1 - \left\{ {}^{6}C_0 \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^{6-0} + {}^{6}C_1 \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{6-1} \right.$

$\left. + {}^{6}C_2 \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{6-2} \right\}$

$$P(x=2) = \frac{e^{-0.2}(0.2)^2}{2!} = 0.0082$$

No of zero defective screws $= 5000(.8187)$

$= 4094$

No. of 1 defective screws $= 5000(0.1637)$

$= 819$

No. of 2 defective screws

$= 5000\ (0.0082) = 41$

$y = ax + b$

x	y	xy	x^2
50	12	600	2500
70	15	1050	4900
100	21	2100	10000
120	25	3000	14400
340	73	6750	31800

$340a + 5b = 73$

$31800a + 340b = 6750$

$a = 0.19 \quad b = 2.28$

$y = 0.19x + 2.28$

$x = 80 \quad y = 0.19(80) + 2.28 = 17.48$

$x = 90 \quad y = 0.19(90) + 2.28 = 19.38$

Find the co-efficient of correlation

x	10	14	18	22	26	30
y	18	12	24	6	30	36

$\bar{x} = \frac{1}{n}\Sigma x = \frac{1}{6}(120) = 20$

$\bar{y} = \frac{1}{n}\Sigma y = \frac{1}{6}(126) = 21$

Let $X = x - 20 \quad Y = y - 21$

x	y	X	Y	X^2	Y^2	XY
10	18	-10	-3	100	9	30
14	12	-6	-9	36	81	54
18	24	-2	3	4	9	-6
22	6	2	-15	4	225	-30
26	30	6	9	36	81	54
30	36	10	15	100	225	150

$\Sigma X^2 = 280 \quad \Sigma Y^2 = 630$

$\Sigma XY = 252$

x	y	$Y = \log_e y$	xY	x^2
0	5.02	1.6134	0	0
2	10	2.3026	4.6052	4
4	31.62	3.4538	13.8152	16

$\Sigma x = 6 \quad \Sigma x^2 = 20 \quad \Sigma Y = 7.3698$

$\Sigma xY = 18.4204$

NE's

$3A + 6b = 7.3698$

$6A + 20b = 18.4204$

$6A + 12b = (7.3698 \times 2)$

$6A + 20b = 18.4204$

$-8b = -3.6808$

$b = 0.4601$

$3A = 7.3698 - 6b$

$= 7.3698 - 6(0.4601)$

$= 4.6092$

$A = 1.5364$

$a = e^A = e^{1.5364} = 4.647$

$$y = ax^2 + bx + c$$

$$y = ax^2 + bx + c$$

$$\Sigma y = a\Sigma x^2 + b\Sigma x + nc \quad (1)$$

$$\Sigma xy = a\Sigma x^3 + b\Sigma x^2 + c\Sigma x \quad (2)$$

$$\Sigma x^2 y = a\Sigma x^4 + b\Sigma x^3 + c\Sigma x^2 \quad (3)$$

$\Sigma x = 0$ $\quad \Sigma x^2 = 1000$ $\quad \Sigma x^3 = 0$

$\Sigma y = 56$ $\quad \Sigma xy = 160$ $\quad \Sigma x^2 y = 11600$

$n = 5$

$\Sigma x^4 = 340000$

$56 = 1000a + 5c$

$160 = 1000b$

$11600 = 340000a + c(1000)$

$b = \frac{160}{1000} = 0.16$

$1000a + 5c = 56$ — (1)

$3400a + 10c = 116$ — (2)

(1) × 2 — (2) $\quad 2000a + 10c = 112$

$3400a + 10c = 116$

$-1400a = -4$

$a = 350$ $\quad a = \frac{4}{1400}$

$= .002857$