

22492

23124

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.
(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Solve any FIVE of the following : **10**

- a) State the Eulerson's rule for numbering events.
- b) If $P(A) = \frac{2}{3}$, $P(B) = \frac{2}{5}$ and $P(A \cup B) = \frac{1}{3}$, then find $P(A \cap B)$.
- c) Define the following terms of probability
- i) Sample space
 - ii) Event
- d) If $b_{yx} = \frac{15}{4}$, $b_{xy} = \frac{3}{20}$, then find correlation coefficient between x and y .
- e) Verify whether the following functions can be regarded as pmf for the given values of x .

$$P(x) = \begin{cases} \frac{x-1}{3} & , \quad x = 1, 2, 3 \\ 0 & , \quad \text{otherwise} \end{cases}$$

P.T.O.

- f) Define -
- pmf (probability mass function) and
 - cdf (cumulative density function)
- g) The coefficient of correlation between two variables x and y is 0.48. The covariance is 36 and variance of x is 16. Find the standard deviation of y .

2. Solve any FOUR of the following : **12**

- A tickets marked with a number from 1 to 9 are placed in a bag. One ticket is drawn at random. What is the probability that the number on the ticket is
 - odd and
 - a multiple of 3
- 2 dice are thrown simultaneously and the sum of the numbers obtained is found to be 7. What is the probability that the number 3 has appeared atleast once ?
- A man is known to speak truth 3 times out of 4. He takes out a card at random from a well shuffled pack of 52 playing cards and reports it as a king. Find the probability that it is actually a king.
- Find for a bivariate data :
 $\mu = 0.85$, $\sigma_x = 3.01$, $\sigma_y = 3.03$, $\sum(x - \bar{x})(y - \bar{y}) = 125$
- For a bivariate data, $\bar{x} = 53$, $\bar{y} = 28$, $b_{yx} = -1.5$, $b_{xy} = -0.2$, estimate y when $x = 50$.

3. Solve any FOUR of the following : **12**

- a) A random variable X has the following probability distribution

X	0	1	2	3	4
$P(X = x)$	k	$2k$	$4k$	$2k$	k

Find -

- Value of k
- $P(X \geq 2)$

- b) Obtain the expected value and variance of X for the following probability distribution.

X = x	-2	-1	0	1	2
P(X = x)	0.2	0.3	0.1	0.15	0.25

- c) A fair coin is tossed 12 times. Find the probability of getting exactly 7 heads.
- d) If X follows Poisson distribution with parameter $m = 5$, Find
- $P(X = 5)$
 - $P(X \geq 2)$ ($e^{-5} = 0.0067$)
- e) The grades of an exam are normally distributed with mean 500 and S.D. 100. Find the probability that a randomly selected score is greater than 620. Given that $A(1.2) = 0.3849$.

4. Solve any THREE of the following :

12

- Discuss any two similarities and differences of CPM and PERT.
- Draw the AON (Activity on Arrow Network) diagram as well as Arrow diagram.

Activity	Immediate predecessor	Activity	Immediate predecessor
A	–	G	B, C
B	–	H	C
C	–	I	E, F
E	A	J	G, H
F	A, B	K	H

- A project consists of a series of a tasks labelled A, B, ..., H, I. with the following relationship. Draw the network diagram.
 $A < D, E$; $B, D < F$; $C < G, B < H, F, G < I$
- Define float. Explain its different types and their importance.
- Explain latest start time and latest finish time. How are this determined ?

5. Solve any THREE of the following : 12

- a) From the data of 15 pairs of observations on X and Y following results are obtained.

$$\bar{x} = 25, \quad \bar{y} = 18, \quad \sum (x_i - \bar{x})^2 = 136$$

$$\sum (y_i - \bar{y})^2 = 148, \quad \sum (x_i - \bar{x}) (y_i - \bar{y}) = 122.$$

Find :

- i) The line of regression of Y on X
 - ii) The line of regression of X on Y
- b) In the following data, arithmetic means of X and Y series are 6 and 8 respectively.

X	6	2	10	4	8
Y	9	11	–	8	7

- i) Estimate missing observation
 - ii) Calculate correlation coefficient
- c) In a beauty contest, two judges ranked the 12 entries as follows.

x	1	2	3	4	5	6	7	8	9	10	11	12
y	12	9	6	10	3	5	4	7	8	2	11	1

Calculate spearman's rank correlation coefficient.

- d) If the rank correlation coefficient is 0.5 and $\sum d_i^2 = 42$. Assuming that no ranks are repeated find the number of pairs of observations.
- e) A sample of five items is taken from the production of a firm. Length and weight of the five items are given below

Length (cm)	3	4	6	7	10
Weight (gm)	9	11	14	15	16

Calculate Karl Pearson's Coefficient of correlation between length and weight.

6. Solve any TWO of the following :

12

- a) The age in years of fourteen young couples is given below.

Husband (X)	21	25	26	24	22	30	19	24	28	32	31	29	21	21
Wife (Y)	19	20	24	21	22	24	18	22	19	30	27	26	19	18

Obtain the line of regression of age of wife on age of husband.

- b) The equation of two regression lines are
- $3x + 2y = 26$
- and
- $6x + y = 31$

Find –

- i) \bar{x} and \bar{y}
 - ii) b_{yx} and b_{xy}
 - iii) If $V(Y) = 36$, obtain $V(X)$
 - iv) r
- c) Find the equation of line of regression of Y on X and X on Y for the following data :

$$n = 10, \sum(x_i - \bar{x})(y_i - \bar{y}) = 1220$$

$$\sigma_x^2 = 130, \sigma_y^2 = 165$$

Estimate Y for X = 40.
