

22492

12425

03 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) Illustrate your answers with neat sketches wherever necessary.  
(4) Figures to the right indicate full marks.  
(5) Assume suitable data, if necessary.  
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.  
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

1. **Attempt any FIVE of the following:** **10**
- a) Give any two objectives of network analysis.
- b) Let  $S = \{a, b, c, d, e, f, g, h\}$ ,  $A = \{a, b, d, e\}$   
 $B = \{b, d, e, g, h\}$ ,  $C = \{c, e, h\}$ . List the elements of the following events:  
i)  $A \cap B'$   
ii)  $(A \cup B \cup C)'$
- c) Two cards are drawn from a pack of 52 playing cards. Find the probability that  
i) Both are black  
ii) Both are diamond
- d) From the given following data, obtain the linear regression estimates of X for Y=10.  
 $\bar{X} = 7.6$ ,  $\bar{Y} = 14.8$ ,  $\delta x = 3.6$ ,  $\delta y = 25$  and  $\gamma = 0.8$ .

P.T.O.

- e) Verify whether each of the following function can be regarded as the p.m.f. of the random variable for the given value of x,

$$p(X=x) = \begin{cases} \frac{x^2}{5} & , x=0, 1, 2 \\ 0 & , \text{otherwise} \end{cases}$$

- f) The p.d.f. of continuous random variable X is given by,

$$f(x) = \frac{x}{8}, \quad 0 < x < 4$$

$$= 0, \quad \text{otherwise}$$

Find:

- i)  $P(X \leq 2)$   
 ii)  $P(2 \leq x \leq 3)$
- g) Draw scatter diagram and identify the type of correlation for the following data:

X	1	2	3	4	5	6	7	8	9
Y	12	11	13	15	14	17	16	19	18

**2. Attempt any FOUR of the following:**

**12**

- a) A fair die is thrown two times. What is the probability that -
- i) Product of the numbers on the upper-most face is 6.  
 ii) Sum of the numbers on the uppermost face is 8.
- b) If  $P(A) = \frac{1}{3}$ ,  $P(B) = \frac{2}{5}$  and  $P(A \cup B) = \frac{8}{15}$  Find:
- i)  $P(A/B)$   
 ii)  $P(A' \cap B')$
- c) A box contains 75 tickets numbered from 1 to 75. One ticket is drawn at random from the box. What is the probability that -
- i) Number on ticket is divisible by 6.  
 ii) Number on ticket is a perfect square.
- d) The equation of two regression lines are  $4y = 9x + 15$  and  $25x = 6y + 7$ .

Find:

- i) Correlation coefficient between X and Y  
 ii)  $\bar{X}$  and  $\bar{Y}$ .

- e) For a bivariate data of  $\bar{X}=53$ ,  $\bar{Y}=28$ ,  $b_{yx}=-1.5$  and  $b_{xy}=-0.2$ .

Find -

- i) Correlation coefficient between X and Y
- ii) Estimate Y when  $X=50$ .

**3. Attempt any FOUR of the following:**

**12**

- a) For the following distribution of X, Find:

- i) Value of K
- ii) Find  $P(X \geq 2)$ ,  $P(X < 3)$ ,  $P(X \leq 1)$

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

- b) If X has binomial distribution with  $n=20$ ,  $P=\frac{1}{10}$ , Find the mean  $E(X)$ , and variance  $V(X)$ .
- c) A fair coin is tossed 12 times find the probability of getting.
  - i) Exactly 7 heads
  - ii) At least two heads
  - iii) At most three heads
- d) If X has poisson distribution with variance 2, Find:
  - i)  $P(X=4)$
  - ii)  $P(X \leq 4)$
  - iii) Mean of X (use  $e^{-2}=0.1353$ )
- e) A fair coin is tossed 3 times. A person receives Rs.  $X^2$ . If he gets X number of heads in all. Find his expected gain.

**4. Attempt any THREE of the following:****12**

- a) Explain three time estimates in PERT.
- b) For the following project-
  - i) Draw network diagram
  - ii) Find critical path and project completion time
  - iii) Identify critical activities.

Activity	A	B	C	D	E	F	G	H
Preceding activity	–	A	A	B	C	D	D & E	F & G
Duration (in Days)	6	5	2	4	2	1	5	3

- c) State Fulkerson's rule for numbering of events in a network diagram.
- d) i) Draw PERT network diagram and find expected completion time of project.
- ii) What is the probability that the project will be completed in 21 days?

Activity	Preceding Activity	Time (in days)		
		Optimistic	Must Likely	Pessimistic
A	-	2	5	8
B	-	2	5	14
C	A	4	6	14
D	A	5	7	15
E	B, C	2	3	10
F	D	3	3	3
G	E	1	2	3

- e) You are given the following details for a project consisting of 8 activities -

Activity	A	B	C	D	E	F	G	H
node	1-2	1-3	1-5	2-3	2-4	-6	3-6	5-6
Duration (in days)	4	6	13	5	20	10	6	16

- i) Construct the network diagram and identify critical path.
- ii) Find free float for activity B.

**5. Attempt any THREE of the following:****12**

- a) The coefficient of correlation between two variables X and Y is 0.3. The covariance is 12 and the variance of X is 9. Find the standard deviation of Y.

- b) Calculate coefficient of correlation for the following data -

X	5	4	6	8	7
Y	4	6	7	8	5

- c) Ranking of 10 students in mathematics and physics are as follows - Two numbers within brackets denote the ranks of the students in mathematics and physics -

(1, 1), (2, 10), (3, 3), (4, 4), (5, 5), (6, 7), (7, 2), (8, 6), (9, 8), (10, 9). Calculate spearman's rank correlation coefficient.

- d) In the following data, one of the value of Y is missing. Arithmetic means of X and Y series are 6 and 8 respectively.

(X)	6	2	10	4	8
(Y)	9	11	?	8	7

Estimate missing observation.

- e) If the rank correlation coefficient is  $\frac{2}{3}$  and  $\sum d_i^2 = 55$ , then find the number of pairs of observations (Assume that no rank is repeated).

**6. Attempt any TWO of the following:****12**

- a) The following table gives the aptitude test scores and productivity indices of 10 workers selected at random -

i) Obtain the two regression equations and

ii) Obtain the line of regression to predict X for Y=75

Aptitude Score (X)	60	62	65	70	72	48	53	73	65	82
Productivity index (Y)	68	60	62	80	85	40	52	62	60	81

- b) From the data 7 pairs of observations on X and Y following results are obtained :

$$\Sigma (x_i - 70) = -38, \Sigma (y_i - 60) = -5,$$

$$\Sigma (x_i - 70)^2 = 2990, \Sigma (y_i - 60)^2 = 475,$$

$$\Sigma (x_i - 70) (y_i - 60) = 1063.$$

- i) Obtain the line of regression of Y on X
  - ii) Obtain the line of regression of X on Y
  - iii) Obtain the correlation coefficient between X and Y
- c) In a partially destroyed laboratory record of an analysis of regression data, the following data are eligible :

Variance of X = 9

Regression Equations :  $8x - 10y + 66 = 0$  and

$$40x - 18y = 214$$

Find on the basis of above information;

- i) The mean value of X and Y
  - ii) Correlation coefficient between X and Y.
  - iii) Standard deviation of Y.
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