



2 Answer the following questions : (any four)

16

- (a) Find standard deviation for the following given data :  
15, 18, 17, 18, 17, 15, 16, 10
- (b) Find mean, median and mean deviation for the data given below :

<i>Income</i>	40	45	48	55	69	80	85	100
<i>No of Employee</i>	6	8	3	8	12	15	6	4

- (c) A goal scored by Team A and Team B in football match during a season was as follows. Find out which team is more stable or consistent ?

<i>No of goals scored</i>	0	1	2	3	4	5
<i>Team A</i>	27	9	8	5	4	2
<i>Team B</i>	17	9	6	5	3	2

- (d) In an urn there are 3 red and 7 white balls. One ball is selected at random from the urn and in place of it a ball of other colour is placed. Now one ball is drawn at random from the urn. What is the probability that it is red ?
- (e) The probability that a bomb dropped from a plane will hit a target is  $\frac{2}{5}$ . Two bombs are enough to destroy a palace of bugdad. If 4 bombs are dropped on a palace, find the probabilities that.
- (1) The palace will be destroyed.
  - (2) The palace will be partially destroyed.
- (f) Fit a Poisson distribution to the following data;  
[ $e^{-0.6} = 0.5488$ ]

<i>x</i>	0	1	2	3	4
<i>f</i>	110	65	21	3	1

3 Answer the following questions : (any three)

9

(a) Find coefficient of Rank correlation

x:	35	40	42	43	40	53	54	49	41	55
y:	102	101	97	98	38	101	97	92	95	95

(b) Find the two regression line using the data given below and hence estimate x for y =30.

$$N = 9, \bar{x} = 30, \bar{y} = 40, (x - \bar{x})^2 = 120, (y - \bar{y})^2 = 346, (x - \bar{x})(y - \bar{y}) = 193.$$

- (c) In a random sample of 500 persons from Maharashtra, 200 are found to be consumer of vegetable oil. In another sample of 400 persons from Gujarat., 200 are found to be consumer of vegetable oil. Discuss whether the data reveal a significant difference between Maharashtra and Gujarat so far as production of vegetable oil consumer is concerned.
- (d) A company is producing steel tubes in inner diameter of 2.00 cms. A sample of 10 tubes gives mean inner diameter of 2.01 cms, and a variance of 0.004 cms square. Is the difference in the means significant ?
- (e) Explain "f "distribution.

## SECTION-II

4 Attempt any eleven :

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- (1) Give an example of order of differential equation.
- (2) What is mean Homogeneous differential equation ?
- (3) What is linear differential equation ?
- (4) What is Laplace transform ?
- (5) Find derivative of  $y = \log (\log x)$
- (6) Find L {cost}
- (7) Write necessary and sufficient condition for exact differential equation.
- (8) Write Bernouli's equation ?
- (9) Prove that  $L(e^{-at}) = \frac{1}{(s+a)}$ .
- (10) Write linearity property of Laplace transform.

(11) Solve the differential equation  $(D^2-5D+6) y = 0$ .

(12) Prove that  $L(1) = \frac{1}{s}$

(13) Define integrating factor.

(14) Write any two characteristic of mathematical model.

(15) Write Cauchy's mean value theorem ?

**5 Solve any three: 12**

(1)  $y(1+x)dx + x(1+y)dy = 0$

(2)  $(2x+3y-5)dy + (3x+2y-5)dx = 0$

(3)  $(x+2y^3)dy/dx = y$

(4) Solve  $y'' + 2y' - 8y = e^{3x}$

(5) Solve  $(D^2+4D+5) y = 0$ , given that when  $x = 0$ ,  $y = 1$  and  $dy/dx = 2$ .

**6 Attempt any two: 12**

(1) Explain mathematical model and write steps which are necessary for construction of a mathematical model.

(2) Evaluate following :

(a)  $L^{-1} \left\{ \frac{s^2 + 2s - 4}{(s^2 + 2s + 5)(s^2 + 2s + 2)} \right\}$

(b)  $L^{-1} \left\{ \frac{4s + 12}{s^2 + 8s + 16} \right\}$

(c) Use Laplace transforms method to solve

$(d^2y/dt^2) - 3(dy/dt) + 2y = 4e^{2t}$  given that

$y(0) = y'(0) = 5$ .

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