16117

3 Hours / 100 Marks   Seat No.

Instructions – (1) All Questions are *Compulsory*.

(2) Answer each next main Question on 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 TEN of the following:**   **20**

a) If $f(x) = x^3 + 3\sin x + x$ then show that $f(x)$ is an odd function.

b) Evaluate $\displaystyle \lim_{x \to 2} \frac{(x-2)}{(x^2 + x - 6)}$

c) Find dy/dx if $y = e^x \cdot \tan x$

d) Find $\dfrac{dy}{dx}$ if $y = \sqrt{3x + 5}$

e) Find dy/dx if $x = a \sec t$ and $y = b \tan t$

f) Evaluate $\displaystyle \int \frac{x+1}{x-1} dx$

g) Evaluate $\displaystyle \int \frac{1}{16 - 9x^2} dx$

Marks

h) Evaluate $\int \sin^2 x \, dx$

i) Find number of observations if sum of all the observations is 1728 and A.M. of observations is 64.

j) The daily earning of 12 workers in a factory are 25, 24, 23, 32, 40, 27, 30, 20, 25, 10, 15, 45. Find median and mode.

k) Define :
   (i) Quartile deviation
   (ii) Standard deviation

l) Calculate mean deviation about the mean of the digits: 1, 2, 3, 4, 5, 6, 7, 8 and 9.

2. **Attempt any FOUR of the following:** **16**

a) If $y = f(x) = \dfrac{x-5}{5x-1}$ show that $f(y) = x$

b) Evaluate $\displaystyle\lim_{x \to 0} \dfrac{3^x + 3^{-x} - 2}{x^2}$

c) Evaluate $\displaystyle\lim_{x \to 3} \dfrac{\log x - \log 3}{x - 3}$

d) Find $\dfrac{dy}{dx}$ if $y = \sin^{-1}(3x - 4x^3)$

e) Differentiate $\tan^{-1}\left(\dfrac{x}{\sqrt{1 - x^2}}\right)$ wrt. x.

f) If $y = \tan^{-1}\left(\dfrac{a+x}{1-ax}\right)$ find $\dfrac{dy}{dx}$

3. **Attempt any FOUR of the following:** 16

a) Find maximum and minimum values of $x^3 - 9x^2 + 24x$

b) Divide 20 into two parts such that the product of one part and cube of other part is maximum.

c) If $13x^2 + 2x^2y + y^3 = 1$ find $\dfrac{dy}{dx}$ at $(1, -2)$.

d) Evaluate $\displaystyle\int_0^{\pi/2} \dfrac{\sin x}{\sin x + \cos x} dx$

e) Evaluate $\displaystyle\int \dfrac{e^x(x+1)}{\cos^2(xe^x)} dx$

f) Evaluate $\displaystyle\int \dfrac{\sec^2 x}{3\tan^2 x - 2\tan x - 5} \cdot dx$

4. **Attempt any FOUR of the following:** 16

a) Evaluate $\displaystyle\int_0^{\pi/2} \sin^3 x \, dx$

b) Evaluate $\displaystyle\int \dfrac{x+1}{x(x^2-4)} dx$

c) Arrange the following data into frequency distribution table showing classes 1-10, 11-20, 21-30 .... etc., tally marks, frequency, class-marks and less than cumulative frequency.
70, 55, 51, 42, 57, 45, 60, 47, 63, 53, 33, 65, 39, 82, 55, 64, 50, 25, 65, 75, 30, 20, 58, 52, 36, 45, 42, 35, 40, 61, 53, 59, 49, 41, 15, 52, 46, 42, 08, 45, 39, 55, 65, 45, 63, 64, 48, 04, 35, 26, 18, 93.

d) The annual salaries of a group of workers are given in the following table. Mean salary is Rs. 63.6/-. Find the missing frequency.

Salary hundred in Rs.	45	50	55	60	65	70	75	80
No. of workers	3	5	–	7	9	7	4	7

e) Find mode graphically for the following data:

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	4	8	12	15	12	6	3

f) Find median (By formula) for the following distribution.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	6	11	22	24	28	11	15	13	12	8

5. **Attempt any <u>FOUR</u> of the following:** **16**

a) The following frequency distribution gives weekly wages in Rs. and No. of workers.

Weekly wages (in Rs.)	100-119	120-139	140-159	160-179	180-199	200-219	220-239
No. of workers	25	45	55	35	25	10	5

Draw an ogive curve and determine the median.

b) Find Q.D. and coefficient of Q.D. for the following data:

C.I.	0-10	10-20	20-30	30-40	40-50	50-60	60-70
f_i	6	5	8	15	7	6	3

c) Find mean deviation from mean of the following distribution.

C.I.	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
f_i	4	6	10	5	7	3	9	6

d) Find combined S.D. of groups A and B taken together. Give that

Group	Size	A.M.	S.D.
A	100	66	6
B	200	63	4

e) The two sets of observations are given below :

Set - I	Set - II
$\bar{x} = 34.5$	$\bar{x} = 28.5$
$\sigma = 5$	$\sigma = 4.6$

f) Calculate coefficient of variation for the following data :

Marks	15-25	25-35	35-45	45-55	55-65	65-75
No. of students	12	42	85	37	16	8

Marks

6.   **Attempt any FOUR of the following:**   **16**

a) The A.M. and S.D. of 100 items are found to be 40 and 10. At the time of calculation two items are wrongly taken as 30 and 70 instead of 3 and 27. Find correct mean and S.D.

b) Calculate coefficient of correlation for the data :
$n = 11, \Sigma x = 117, \Sigma y = 260, \Sigma xy = 2827,$

$\Sigma x^2 = 1313, \Sigma y^2 = 6580$

c) Compute coefficient of correlation (Karl Pearson's method) for the following data :

x	2	4	5	6	8	11
y	18	12	10	8	7	5

d) Calculate spearman's rank correlation coefficient for the following data:

Rank in statistics	9	10	6	5	7	2	4	8	1	3
Rank in Physics	1	2	3	4	5	6	7	8	9	10

e) Find regression line of x on y for the following data :

x	2	3	5	7	8	10	12	15
y	2	5	8	10	12	14	15	16

f) The equations of two lines of regression obtained in an analysis are : $2x + 3y - 8 = 0$ and $x + 2y = 5$. Find :

(i) $\bar{x}$

(ii) $\bar{y}$

(iii) Regression coefficients like byx and bxy.

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