# 17217

**14115**

**3 Hours / 100 Marks** Seat No. | | | | | | | | |

*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 <u>TEN</u> of the following:** **20**

a) If $f(x) = 3x^2 - 5x + 7$ show that $f(-1) = 3f(1)$.

b) Evaluate $\lim_{x \to 3} \frac{x^3 - 27}{x - 3}$

c) Evaluate $\lim_{x \to 0} \frac{3^x - 5^x}{\sin x}$

d) Find $\frac{dy}{dx}$ if $y = \log_{10} x + 3^x$

**Marks**

e) Find $\frac{dy}{dx}$ if $y = e^{3x}\sin 2x$

f) Find $\frac{dy}{dx}$ if $y = \frac{\sin x}{1-\cos x}$

g) Evaluate $\int \frac{x}{x+1}\,dx$

h) Evaluate $\int_0^{\infty} e^{-x}\,dx$

i) Evaluate $\int \frac{(x+1)}{(x+2)\,(x+3)}\,dx$

j) The mean of 25 observations is 40. if each observations is increased by 2. Find the new mean.

k) Find Median of following data.

800, 725, 750, 900, 925, 910, 1000, 790, 870, 920

l) Find the coefficient of range for followings:

40, 52, 47, 28, 45, 36, 47, 50

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

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

b) Evaluate $\lim_{x \to \infty} \sqrt{x^2+7x} - x$

c) If $x^3 + y^3 = 3axy$ Find $\frac{dy}{dx}$ at $\left(\frac{3a}{2}, \frac{3a}{2}\right)$

d) Differentiate $(\log x)^{\sin x}$ w.r.t. $x$.

**Marks**

e) If $e^y = y^x$ prove that $\frac{dy}{dx} = \frac{(\log y)^2}{\log y - 1}$.

f) Differentiate $\sin^{-1}\left[\frac{2x}{1+x^2}\right]$ w. r. t. $\cos^{-1}\left[\frac{1-x^2}{1+x^2}\right]$.

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

a) If $y = \sin^{-1} x$ prove that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$.

b) Find $\frac{dy}{dx}$ if $x = a(\cos t + t\sin t)$ and $y = a(\sin t - t\cos t)$.

c) Find Median from the following data.

| 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 | 08 |

d) Find the mode graphically from the following data.

| C.I. | 0-5 | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 |
|---|---|---|---|---|---|---|---|---|
| Frequency | 7 | 10 | 16 | 32 | 24 | 18 | 10 | 5 |

e) The average of marks obtained by a group of 100 students in a class is 30. The average of group of the male students is 27 and that of group of female students is 32. Find the composition of group.

f) Find Mean derivation (M.D.) from mean of following:

| C.I. | 10−20 | 20−30 | 30−40 | 40−50 | 50−60 | 60−70 |
|---|---|---|---|---|---|---|
| Frequency | 4 | 6 | 10 | 18 | 9 | 3 |

**Marks**

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

a) Evaluate $\int \frac{e^x(x+1)}{\cos^2(xe^x)}\,dx$

b) Evaluate $\int \frac{1}{4+5\cos x}\,dx$

c) Evaluate $\int x\tan^{-1}x\,dx$

d) Evaluate $\int \frac{x+1}{x(x^2-4)}\,dx$

e) Evaluate $\int_0^{\pi/2} \frac{\sin x}{\cos x+\sin x}\,dx$

f) Evaluate $\int_1^2 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{3-x}}\,dx$

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

a) The length in cms of bars are as follows:
106, 82, 129, 204, 90, 107, 123, 139, 111, 107, 76, 125, 109, 141, 81, 81, 111, 115, 136, 131, 109, 92, 128, 123, 75, 107, 86, 101, 90, 84, 93, 126, 84, 98, 110, 187, 68, 99, 110, 81, 95, 130, 113, 78, 118, 115, 70, 186, 115, 104.
From a grouped frequency table of equal width of 20 cm in a such a way class mark of first class is 70.

b) Find the Median graphically by plotting the ogive curve for the following distribution.

| Marks | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 |
|---|---|---|---|---|---|
| No. of Students | 5 | 12 | 16 | 4 | 3 |

**Marks**

c) Calculate the standard deviation (S.D.) from the frequency table given below.

| Rainfall | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | 140-150 |
|---|---|---|---|---|---|---|---|---|
| No. of Places | 06 | 7 | 12 | 19 | 21 | 18 | 11 | 6 |

d) The two sets of observations are given below:

| Set I | Set II |
|---|---|
| $\bar{x} = 82.5$ | $\bar{x} = 48.75$ |
| $\delta = 7.3$ | $\delta = 8.35$ |

Which of the two sets is move consistent?

e) Find the correlation coefficient between $x$ and $y$, when the line of regressions are:

$2x - 9y + 6 = 0$ and $x - 2y + 1 = 0$

also find mean of $x$ and $y$.

f) Find the regression line of $y$ on $x$ for followings.

| $x$ | 1 | 4 | 2 | 3 | 5 |
|---|---|---|---|---|---|
| $y$ | 3 | 1 | 2 | 5 | 4 |

**Marks**

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

a) Find the range, coefficient of range, quartile deviation coefficient of quartile deviation for the followings:

| Mass in kg | 40 – 44 | 45 – 49 | 50 – 54 | 55 – 59 | 60 – 64 |
|---|---|---|---|---|---|
| No. of students | 5 | 18 | 42 | 27 | 8 |

b) Calculate the coefficient of correlation for the data.

| Year of service | 11 | 7 | 9 | 5 | 8 | 6 | 10 |
|---|---|---|---|---|---|---|---|
| Monthly income in Rs. | 7 | 5 | 3 | 2 | 6 | 4 | 8 |

c) Find Spearman's coefficient of rank correlation for the following data.

| Student No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Marks in Maths | 52 | 63 | 45 | 36 | 72 | 65 | 47 | 25 |
| Marks in Physics | 62 | 53 | 51 | 25 | 79 | 43 | 60 | 33 |

d) Calculate the correlation coefficient from the following data.

$n = 11$, $\Sigma x = 117$, $\Sigma x^2 = 1313$, $\Sigma y^2 = 6580$,
$\Sigma y = 260$, $\Sigma xy = 2827$.

e) The coefficient of rank correlation of the marks obtained by 10 students in English and Chemistry was found to be 0.5 it was later discovered that the difference in ranks in two subjects obtained by one of student was wrongly taken as 3 instead of 7. Find the correct correlation coefficient.

f) Let P and S be two series of numbers. The mean and S.D. of P are 100 and 8 and that of S are 103 and 4 respectively the correlation coefficient between the series is 0.4. Find regression equation of S on P and P on S.