

19. From the following data obtain the two regression equations. Also estimate the value of

(a)  $x$  when  $y = 25$  and

(b)  $y$  when  $x = 30$ .

X: 25 28 30 32 35 36 38 39 42 45

Y: 20 26 29 30 25 18 26 35 35 46

2205/A11

OCTOBER 2011

MATHEMATICS

Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. If  $x = a(t + \sin t)$ ,  $y = a(1 - \cos t)$  find  $\frac{dy}{dx}$ .

2. Prove that if  $y = \sin(m \sin^{-1} x)$  then  $(1 - x^2)y'' - xy' + m^2y = 0$ .

3. Evaluate  $\int \frac{xdx}{1 + x^4}$ .

4. Evaluate  $\int \sin^{-1} x dx$ .

5. Find the unit vector perpendicular to each of the vector  $2\vec{i} + \vec{j} - \vec{k}$  and  $\vec{i} - 2\vec{j} + \vec{k}$ .

6. Find the inverse of the matrix  $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ .

7. Find the angle between the pair of straight lines  $ax^2 + 2hxy + by^2 = 0$ .
8. Find the equation of the circle which touches the axes and whose centre lies on the line  $x - 2y = 3$ .
9. Find the mean, median and mode for the following data 18, 15, 18, 16, 17, 18, 15, 19, 17, 17.
10. Eight coins are thrown simultaneously. Find the probability of getting at least six heads.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Differentiate :
- (a)  $xe^x \sin x$
- (b)  $\log(\log(\log x))$

12. Evaluate :

- (a)  $\frac{dx}{x^2 - 6x + 5}$
- (b)  $\int \sin^{-1} x dx$

13. Show that the system of equations  $x + 2y + z = 11$ ,  $4x + 6y + 5z = 8$ ,  $2x + 2y + 3z = 19$  inconsistent.

2

2205/A11

14. Prove that the equation  $12x^2 + 7xy - 10y^2 + 13x + 45y - 35 = 0$  represent a pair of straight lines and find the angle between them.

15. The data showing the test scores made by 10 salesman on an intelligence test and their weekly sales are recorded in the following table.

Salesman :	1	2	3	4	5	6	7	8	9	10
Test scores :	50	70	50	60	80	50	90	50	60	60
Sales ('000 Rs.)	25	60	45	50	45	20	55	30	45	30

Calculate the rank correlation coefficient between intelligence and efficiency in salesmanship.

16. Fit a Poisson distribution for the following data :

$$X: 0 \quad 1 \quad 2 \quad 3 \quad 4$$

$$F: 123 \quad 59 \quad 14 \quad 3 \quad 1$$

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Evaluate :  $I = \int_0^{\pi/2} \log \sin x dx$ .

18. (a) Prove that  $x^2 + 9y^2 + 6xy + 4x + 12y - 5 = 0$  represents two parallel straight lines.

- (b) Show that the straight line  $x + y = 2 + \sqrt{2}$  touches the circle  $x^2 + y^2 - 2x - 2y + 1 = 0$  and find the point of contact.

3

2205/A11