Instructions: DO NOT write or mark anything on the question paper

        i) The question paper has 5 parts namely A, B, C, D & E. Answer all the parts

        ii) Part –A carries 10 marks, part -B carries 20 marks, part –C carries 30 marks and part- E
          carries 10 marks

        iii) Write the question number properly as indicated in the questions paper

PART – A

I.   **Answer all the questions:**   **10 x 1 = 10**

1.   If $A = \begin{bmatrix} 3 & 1 & 4 \\ 5 & 6 & 3x+1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 1 & 6 \\ 4 & 3 \end{bmatrix}$ find 'x' given that $A = B'$.

2.   A card is drawn from a pack of 52 playing cards. What is the probability that it is a queen?

3.   Find the inverse of "If x (x-2) = 0 then x = 2."

4.   Find the sub triplicate ratio of 125:64

5.   What is the yield obtained when ₹5000, 3% stock is purchased at ₹125?

6.   Find the value of $4 \cos^3 10° - 3 \cos 10°$.

7.   Find the centre and radius of $2x^2 + 2y^2 + 6x - 10y + 9 = 0$.

8.   Evaluate $\lim\limits_{x \to 2} \dfrac{x-2}{x^{1/3} - 2^{1/3}}$.

9.   Differentiate $\left[\log\left(\log\left(3x + 5 \right) \right) \right]$ w. r.t x .

10.   Integrate $\int \dfrac{9}{\sin^2 x} \cdot dx$.

PART – B

II.   **Answer any TEN questions.**   **2 x 10 = 20**

11.   If $A = \begin{bmatrix} 3 & -2 & 5 \end{bmatrix}$ find AA′ and A′A.

12.   In how many ways can 6 boys and 6 girls arranged in a row so that:

       (a) All boys are not together.

       (b) No two girls are together.

13.   Find the number of diagonals of a polygon of 20 sides.

14.   Find the converse and inverse of "If the questions are easy then students score better marks."

15.   Four numbers formed by adding 1,5,10 and 15 to a certain number are in proportion. Find the numbers

16.   The Banker's discount and true discount on the sum of money due 3 months hence are ₹ 154.50 and ₹ 150 respectively. Find the sum of money and the rate of interest.

17.   A shopkeeper purchased an electric iron of ₹1000 at 8% VAT from the whole sales and sell it to customer of ₹1400 at 8% VAT.

18. Prove that $\dfrac{SinA + Sin2A}{1 + CosA + Cos2A} = tanA$.

19. Find the equation of the parabola with V(0,0) axis is y-axis and passes through (-1,-3)

20. Evaluate $\lim\limits_{x \to 0} \dfrac{x \tan 4x}{1 - \cos 4x}$.

21. Differentiate $\log\left(\dfrac{1 + \sin x}{1 - \sin x}\right)$ w.r.t x

22. Find the value of x for which the function is increasing if $f(x) = 2x^2 - 96x + 15$.

23. For the demand function $2x - 5y = 7$ (x = number of unit and y is the price per unit). Find the total revenue, Marginal revenue.

24. Integrate $\displaystyle\int \dfrac{x}{\sqrt{x+9}}\,dx$

Section - C

III. **Answer any TEN questions.**   **3 x 10 = 30**

25. Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

26. A Team of eleven is to be chosen out of 16 cricket players of whom 4 are bowlers and 2 are wicket keepers. In how many ways can the team be chosen so that (i) there are exactly 3 bowlers and one wicket keeper (ii) there are atleast 3 bowlers and atleast one wicket keeper.

27. There are 20 girls and 60 boys in a class half of the girls and half of the boys are first class students. A student is selected at random. What is the probability that the student is either a boy or a first class holder?

28. Find the middle terms in the expansion of $\left(\sqrt{x} - \dfrac{4}{x^2}\right)^{11}$

29. Walking 4 kmph a student reaches his college 5 minutes late and if he walks at 5 kmph, he reach 2½ minutes early. What is the distance from his house to the college?

30. A bill for ₹ 2725.25 was drawn on 3-6-2010 and made payable 3 months after due date. It was discounted on 15-6-2010 at 16% per annum. What is the discounted value of the bill and how much did the banker gain?

31. 'A' is manufacturer of electron iron. The cost price of each electric iron in ₹1600. He sells to B and B sells to C and C sells to D the retailer. The tax is 12.5% and the profit is ₹150 at each stage of the selling chain. Find the:
    (i) the total amount of VAT
    (ii) the amount that the purchaser will have to pay.

32. $4\, SinA \cdot Sin(60° + A)\, Sin(60° - A) = Sin3A$.

33. Find the equation of the circle passing through the centre of the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ and centre at (4, -2).

34.   Find k if

$$f(x) = \begin{cases} \dfrac{e^{5x}-1}{2x}, & x \ne 0 \\[2mm] \dfrac{k+x}{2}, & x = 0 \end{cases} \quad \text{is continous at } x = 0$$

35.   Differentiate tan x by first principle.

36.   A ladder of 15ft long leans against a smooth vertical wall. If the top slides downwards at the rate of 2ft/sec. Find how fast the lower end is moving when the lower end is 12ft from the wall.

37.   Show that x^x is minimum at $x = \dfrac{1}{e}$.

38.   Integrate $\int x.\log x \, dx$

Part - D

IV.   **Answer any SIX questions.**   **6 x 5 = 30**

39.   Find the term independent of 'x' in the expansion of $\left(\sqrt{x} + \dfrac{1}{3x^2} \right)^{10}$.

40.   Resolve into partial fraction $\dfrac{2x^2 + 3x + 2}{x^2 - x - 2}$.

41.   Verify whether given propositions is $\left[(\sim p \wedge q) \wedge (q \wedge r) \wedge (\sim q) \right]$, is Tautology or contradiction.

42.   If 8 men and 16 boys can do a piece of work in 6 days and 12 men and 24 boys can do the same work in 8 days. In how many days can 16 men and 20 boys do it.

43.   xyz company supplies water tankers to the government. The first water tanker takes 20,000 labour hours. The government auditors suggest that there should be 90% learning effect rate. The management accepts an order of 8 water tankers in the next year. What will be the labour cost the company will incur at the rate of ₹20 per hour.

44.   Solve the following LPP graphically
        Minimize   z = 5x +4y
        Subject to constraints   200x +100y≥4000
                                 x+2y≥50
                           40x+40y≥1400
                                   x≥0
                                   y≥0

45.   If $\tan^2 (45 + \theta) = \dfrac{a}{b}$ Prove that $\dfrac{b-a}{b+a} = -\sin 2\theta$.

46.   Find the points of intersection of the circle $x^2 + y^2 - 6x - 2y + 5 = 0$ and the line $x - y + 1 = 0$

47.   If $y^x = x^y$. show that $\dfrac{dy}{dx} = \dfrac{y(y - x \log y)}{x(x - y \log x)}$.

48.   Find the area enclosed between the parabola $y^2 = x$ and the line $x + y = 2$,

PART – E

V.   **Answer any ONE question:**   **10 x 1 = 10**

49.   a) Prove that $\lim\limits_{x \to a}\left(\dfrac{x^n - a^n}{x - a}\right) = na^{n-1}$ for all n values

     b) Find the total revenue obtained by raising the output from 10 to 20 units where the marginal revenue is $\dfrac{3x^2}{20} - 10x + 100 \left(x \text{ is the output}\right)$.

50.   a) The monthly expenditure is an office for 3 months is given in the table.

Months	Clerks	No. of Peons	Typists	Total Monthly Sales
July	8	4	6	3750
August	9	9	6	5000
September	12	9	12	8850

Assuming that the salary for the different categories of the staff did not vary from month to month. Calculate the salary for each type of staff per month.

     b) A person is at the top of a tower 75ft high from there he observes a vertical pole and finds the angles of depressions of the top and the bottom of the pole which are 30° and 60° respectively. Find the height of the pole.

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