

**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  $A = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$ ,  $B = [1 \ 6 \ 7]$  find  $A \cdot B$ .
2. In how many ways can the letters of the word HOPPER be arranged.
3. Negate " He likes Mathematics and he does not like logic"
4. If 2, x and 8 are in continued proportion find the value of 'x'
5. Define yield.
6. Find the value of  $3 \sin 10^\circ - 4 \sin^3 10^\circ$
7. Find the equation of the point circle with centre at (4,-3)
8. Evaluate  $\lim_{x \rightarrow 4} \left( \frac{4x-4}{x-2} \right)$
9. Find  $\frac{dy}{dx}$  if  $x^3 - y^3 = a^3$
10. Evaluate  $\int \frac{1}{2x-3} \cdot dx$

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

11. If  $\begin{bmatrix} x+3 & 3 \\ 4 & x-y \end{bmatrix} = \begin{bmatrix} 6 & 3 \\ 4 & 2 \end{bmatrix}$  find x and y
12. Find the number of diagonals of a polygon of 20 sides.
13. A committee of 4 has to be selected from 9 boys and 6 girls what is the probability that the committee contains 2 boys and 2 girls.
14. If the truth value of p is true, q is false Find the truth value of  $\sim (p \rightarrow \sim q) \vee p$
15. Find the ratio between two numbers such that their sum is 40 and their difference is 8.
16. The difference between BD and TD on a certain sum of money due in 6 months is ₹ 27 find the amount of the bill if the rate of interest is 6% per annum.
17. Ramu paid ₹ 60 as sales tax on a Titan Raga watch worth ₹1200. Find the rate of sales tax.

18. Prove that  $\frac{\cos 2A - \cos 12A}{\sin 12A - \sin 2A} = \tan 7A$
19. Find the equation of the diameter of the circle  $2x^2 + 2y^2 + 3x - 5y - 1 = 0$ , which when produced passes through the point  $(-1, 2)$
20. Evaluate  $\lim_{x \rightarrow \infty} \frac{(2x-1)^{20} (3x-1)^{30}}{(2x+1)^{50}}$
21. Differentiate  $\log(xy) = x^2 + y^2$  with respect to  $x$
22. Find the interval in which  $f(x) = 5 + 36x + 3x^2 - 2x^3$  is increasing
23. Integrate  $\int_0^1 \frac{x}{x+1} \cdot dx$
24. Compute the total cost for the marginal cost function  $f'(c) = 12 + 6c - 6c^2$  assuming that the fixed cost is ₹ 150

### Section - C

III. Answer any TEN questions.

3 x 10 = 30

25. If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  show that  $A^2 - 5A + 7I = 0$  hence find  $A^{-1}$
26. Solve  $\begin{vmatrix} x-1 & x+2 & 3 \\ 3 & x+2 & x+1 \\ x+1 & 2 & x+3 \end{vmatrix} = 0$
27. A committee of 4 has to be chosen from 10 boys and 8 girls. In how many ways can this be done if girls are in a majority.
28. A natural number is chosen at random among the first 300 what is the probability that the number so chosen is divisible by 3 or 5
29. Find the term independent of  $x$  in  $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^9$
30. A bill for ₹ 3225 was drawn on 3<sup>rd</sup> February 1995 at 6 months date and discounted on 13<sup>th</sup> March 1995, at the rate of 18% per annum. For what sum was the bill discounted and what is the Banker's gain on this bill.
31. A person sells out ₹4000 of 6.25 Government of India stock at 112.5 and re-invests the proceeds in 8% railway debentures, thereby increasing his income by ₹ 50 at what price did he buy the debentures.
32. Show that  $\cos(120^\circ + A) + \cos(120^\circ - A) = -\cos A$
33. Find the Co-ordinates of the vertex, focus and equation of directrix, ends of latus rectum of the parabola  $5x^2 + 24y = 0$

34. Differentiate  $\cos x$  from the first principle.
35. A Spherical balloon is being inflated that its volume is increasing at the rate of 30 cc / min how fast its surface area increasing when its volume is  $30 \pi \text{cc}$ ?
36. Divide the number 40 into two parts such that their product is maximum.
37. Evaluate  $\int x^2 \log x \, dx$
38. Evaluate  $\int_0^{\pi/2} \sin 5x \cos 3x \, dx$

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

39. The first three terms in  $(1+ax)^n$ , where n is a positive integer are 1, 6x,  $16x^2$  find the values of a and n.
40. Resolve  $\frac{x^2-2}{x(x+1)^2}$  into partial fraction.
41. Verify whether  $p \rightarrow (q \rightarrow r)$  and  $(p \rightarrow q) \rightarrow r$  are logically equivalent or not.
42. If 10 men or 20 boys can do a piece of work in 30 days, how long will 30 boys and 5 men take to do the same work.
43. An Air craft manufacturer supplies air craft engines to different airlines they have been asked to bid for a prospective contract for supply of 90 engines they have just completed an initial trial order for 30 engine involving a total of 6000 direct labour hours at ₹ 20 per hour. It is expected that there will be 80% learning effect. Estimate the labour cost for the new order.
44. A person standing on the bank of a river observes that the angle subtended by a tree on the opposite bank is  $60^\circ$  when he returns 40 meters from the bank. He finds the angle to be  $30^\circ$ . Find the height of the tree and breadth of the river.
45. Prove that  $\sin 4A + \sin 4B + \sin 4C = -4 \sin 2A \sin 2B \sin 2C$
46. Find K if the line  $4x - y + k = 0$ , touches the circle  $x^2 + y^2 + 4x - 8y + 3 = 0$
47. If  $Y = a \cos(\log x) + b \sin(\log x)$  show that  $x^2 y_2 + x y_1 + y = 0$

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

49. a) Evaluate  $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = n a^{n-1}$  For all rational values
- b) A diet for a sick person must contain atleast 4000 units of vitamins, 50 units of minerals and 1400 units of calories. Two foods A and B are available at a cost of ₹ 4 and ₹ 3 per unit respectively. If one unit of A contains 200 units of vitamins, 1 unit of minerals and 40 calories and one unit of food B contains 100 units of vitamins, 2 units of minerals & 40 units of calories find what combinations of food should be used to have the least cost?

50. a) A sales person Ashok has the following record of sales for the month of January February and March 1998 for three products A, B & C. He is paid a commission at fixed rate per unit but at varying rates for products A,B and C

Months	Sales in units			Commission (in ₹)
	A	B	C	
January	9	10	2	800
February	15	5	4	900
March	6	10	3	850

Find the rate of commission payable on A, B &C per unit sold.

- b) Find the value of  $(0.92)^4$  using Binomial theorem

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