Instructions (i)The question paper has five parts namely A, B, C, D and E. Answer all the parts.
(ii)Use the graph sheet for the question on Linear programming in PART E.

PART-A

I.   **Answer ALL the questions.**   1 X 10=10

1. Solve for x, if $\begin{vmatrix} 2x+1 & 3 \\ 2 & 4 \end{vmatrix} = 0$
2. In how many ways can 9 soldiers stand in a queue.
3. Negate : $p \wedge \sim q$
4. Find the third proportional to 4 and 6.
5. Find the index of learning for 70% learning effect.
6. Find value of $Sin70^0 Cos20^0 + Cos70^0 Sin20^0$
7. If radius of the circle $x^2 + y^2 + 4x - 2y - k = 0 \ is \ 4 \ units \ find \ k.$
8. Evaluate $\lim_{x \to 0}(1 + 3x)^{\frac{1}{x}}$
9. Differentiate $7^{Sin\sqrt{x}}$ w.r.t x.
10. Evaluate $\int e^{3x} dx$

PART-B

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

11. If $A = \begin{bmatrix} 3 & -1 \\ 4 & 5 \end{bmatrix} \ find \ X \ such \ that \ A - 2X = \begin{bmatrix} 1 & 4 \\ 2 & -3 \end{bmatrix}$
12. How many 6 digit numbers can be formed from the digits 1,2,3,4,5,6 (no digit being repeated) which are divisible by 5.
13. If A and B are mutually exclusive events with P(A)=$\frac{2}{5}$ and $P(B) = \frac{1}{7}$ find $P(A \cup B)$.
14. Negate: 14 is a divisor of 48 and 28 is not divisible by 82.
15. What must be added to each term in the ratio 4:5 so that it becomes 7:8
16. A banker pays Rs. 2380 on a bill of Rs, 2500, 73 days before the legally due date. Find the rate of discount charged by the banker.
17. If $tanA = \frac{3}{4} \ find \ \ tan3A.$
18. If $tanA = \frac{1}{2} \ and \ \ tanB = \frac{1}{3} \ prove \ that \ A + B = \frac{\pi}{4}$
19. Find the equation of the parabola with focus (1,0) and directrix x=-1
20. Evaluate $\lim_{x \to \infty} \frac{3x^2 - 4x + 7}{2x^4 - 3x + 6}$
21. Differentiate $x + \sqrt{xy} = x^2$
22. The sum of two natural numbers is 48 . Find the numbers when their product is maximum.
23. Integrate $\int \sqrt{1 - Cos2x} dx$
24. Evaluate $\int_0^{\frac{\pi}{2}}(Sinx + Cosx) \ dx$

PART-C

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

25. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 4A + 3I = 0$

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

27. A box contains 7 red, 6 white and 3 blue balls. How many selections 3 balls be made so that   a) none is red   b) one of each colour c) exactly one ball is blue

28. 500 workers can finish a work in 8 days. How many workers will finish the same work in 5 days.

29. Three cards are drawn at random from a pack of well shuffled pack of 52 cards . Find the probability of getting a king, a queen, and a jack.

30. A bill for Rs.14,600 drawn at 3 months after date was discounted on 11-11-95 for Rs. 14,320. If the discount rate is 20% p.a. on what date bill was drawn.

31. A sold Rs.2250 stock at 75 and bought stock at 88.50 with the proceeds. How much stock does he buys if the brokerage is 2% foe selling and 1.5% for buying.

32. If $ye^y = x$ show that $\frac{dy}{dx} = \frac{y}{x(y+1)}$

33. Find the equation of the parabola given that the ends of the latus rectum are L(3,6) ,focus (0,-3) directrix y=3.

34. If $x = e^t(Cost + Sint), \ y = e^t(Cost - Sint) \ show \ that \ \frac{dy}{dx} = -tant.$

35. The radius of a sphere is increasing at the rate of 0.5mt/sec. Find the rate of increase of its surface area and volume after 3 sec.

36. The total cost of a output x is given by $C = 300x - 10x^2 + \frac{x^3}{3}$. Find the level of output.

37. $Evaluate \int \frac{4}{\sqrt{x+1}+\sqrt{x+2}} dx.$

38. $Evaluate \ \int_1^2 logx \ dx$

PART-D

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

39. Find the value of $\left(2 + \sqrt{3}\right)^5 + \left(2 - \sqrt{3}\right)^5$

40. Resolve into partial fractions $\frac{2x^2+16x+29}{(x+3)^2(x+4)}$

41. Prove that $[(p \rightarrow q)\wedge(q \rightarrow r)] \rightarrow [p \rightarrow r] \ is \ a \ tautology$

42. 4 men or 12 boys can do a piece of work in 5 days by working 8 houra per day. In how many days 2 men and 4 boys can do the same work working 12 hours a day.

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 expects an order of 8 water tankers in the next year. What will be total labour hours and labour cost the company will incur at the rate of Rs. 20 per hour.

44. Maximize $Z = 5x + 3y, \ subject \ to \ 3x + 5y \le 15, 5x + 2y \le 10, x, y \ge 0$

45. A person is at the top of a tower 75 feet high from there he observes a vertical pole and finds the angle of the depressions of the top and bottom of the pole which are
$30^0 \ and \ 60^0 \ respectively. Find \ height$ of the pole.

46. Verify $A. adjA = adjA. A = |A|I, if \ A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 4 & 7 \\ 1 & -1 & 1 \end{bmatrix}$

47. If $x^2 - xy + y^2 = a^2 \ show \ that \ \frac{d^2y}{dx^2} = \frac{6a^2}{(x-2y)^3}$

48. Find the area bounded by the parabola $y^2 = x \ and \ the \ line \ x + y = 2$

PART-E

V.   **Answer any ONE question.**   1 X 10 = 10

49. a) Show that the points (2,-4), (3,-1), (3,-3) and (0,0) are concyclic.
   a)   The angles of the elevation of the top of a tower from the base and the top of a building are
$60^0 \ and \ 45^0$ respectively. The building is 20 m tall. Find the height of the tower.

50. a) (a)Evaluate $\lim_{x \rightarrow a} \frac{x^n - a^n}{x-a} = na^{n-1}$ for all rationals (n is +ve,-ve, rationals
   b).Find the value of $(1.2)^5$ using binomial theorem.