PART-A

I. Answer all the questions: $10 \times 1 = 10$

1. If $A = \begin{bmatrix} 2 & 4 \\ 3 & -1 \\ 4 & 0 \end{bmatrix}$, show that $(A')' = A$.

2. In how many ways a committee of 5 can be chosen from 10 students.

3. Negate : " 6 is an even number or $\sqrt{5}$ is not rational"

4. Find the compound ratio of 3: 4 and 4:7.

5. What rate of interest is obtained by investing 9% at 180?

6. If Sin A = $\dfrac{3}{5}$, find Sin 2A

7. Find the equation of directrix for a given parabola $x^2 = 6y$.

8. Evaluate $\lim\limits_{x \to 0} \dfrac{Sin\, a\, x}{b\, x}$

9. If $y = x^e - e^x + e^e + \log e$, then find $\dfrac{dy}{dx}$.

10. Evaluate $\int \dfrac{1}{5e^{-x}}\, dx$.

PART-B

II. Answer any ten questions: $10 \times 2 = 20$

11. If $A = \begin{bmatrix} 1 & 3 \\ 4 & 5 \end{bmatrix}$ prove that A (adj A) = (adj A) A = $|A|\, I$

12. Find n if $^nP_3 = 210$.

13. A bag contains 7 white, 3 red and 4 black balls, One ball is picked up at random. What is the probability that: i) the ball is not black   ii) The ball is red

14. Write the inverse and contrapositive of the compound proposition. "If two straight lines are parallel then they intersect".

15. Find the numbers which should be added to the terms of numerator and denominator of 25:37 to make it 5:6.

16. A bill drawn for 3 months was legally due on 06.07.2018. Find the date of drawing of the bill.

17. Prove that Sin A = 3 sin A – 4Sin³ A

18. Prove that $\dfrac{\sin 3A}{1 + 2\cos 2A} = Sin\, A$

19. If the length of the latus rectum of y^2 8kx is 4, find k

20. Find k for which $f(x) = \begin{cases} k + x, & x = 1 \\ 4x + 3, & x \neq 1 \end{cases}$ is continuous at x = 1.

21. Find $\dfrac{dy}{dx}$, if $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots\dots\infty}}}$

22. Cost function $C = 500x - 20x^2 + \dfrac{x^3}{3}$. Where x is output. Calculate the output when the marginal cost is equal to the average cost.

23. Evaluate $\displaystyle\int_{0}^{\pi/2} (\sin x + \cos x)\,dx$

24. Evaluate $\displaystyle\int (4x^2 - 2x + 7)^{3/2}(4x - 1)\,dx$.

PART-C

III. **Answer any ten questions:** $10 \times 3 = 30$

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

26. Prove that "If each element of any row (or column) of a determinant is the sum of two terms, then the determinant can be expressed as the sum of two determinants"

27. A term of 8 players has to be selected from 14 players. In how many ways the selection can be made if.

    a) Two particular players are always included

    b) Two particular players are always excluded.

28. If A and B are event with $P(A) = \dfrac{5}{8}$, $P(B) = \dfrac{3}{8}$ and $P(A \cup B) = \dfrac{3}{4}$. Find (i) $P(B/A)$ ii) $P(A/B)$

29. Two taps can separately fill a tank in 12 min and 15 minutes respectively. The tank when full can be emptied by a drain pipe in 20 minutes. When the tank was empty, all the three pipes were opened simultaneously. In what time will the tank be filled up?

30. The banker's gain on a bill is $\dfrac{1}{5}th$ of the Banker's discount and the rate of interest is 20% p.a. Find the unexpired period of the bill.

31. A man invests equal sum of money in 4%, 5% and 6% stock, each stock being at par. If the total income of the man is 3600, find his total investment.

32. Following purchases were made from a store.

Item	List Price (Rs)	No of items	Rest of ST
Tape recorder	10,900	2	10%
Suitcase	4200	1	5%
Rain coat	400	3	7%
Mixer	2500	x	2%

Total amount paid by Raju is Rs 34,774. Find the number of mixers bought.

33. Find the length of the chord of the circle $x^2 + y^2 - 6x - 4y - 12 = 0$ on the coordinate axis

34. If $x = a((\theta - Sin\theta)$, $y = a(1 - \cos\theta)$. then prove that $\dfrac{dy}{dx} = \cot\dfrac{\theta}{2}$.

35. If surface area of a spherical soap bubble is increasing at the rate of $0.6\,cm^2/sec$. Find the rate at which its volume is increasing when the radius is 3cms.

36. If the product of two natural numbers is 64. Find the numbers if their sum is minimum.

37. Evaluate $\int x^3 \log x \, dx$

38. Evaluate $\int\limits_{0}^{\pi/2} Sin5x. \, Cos3x \, dx$

PART-D

IV. **Answer any six of the following:** $\qquad$ $6 \times 5 = 30$

39. Evaluate $\left(2 + \sqrt{3}\right)^5 + \left(2 - \sqrt{3}\right)^5$

40. Resolve $\dfrac{1}{x(x^2 - 9)}$ in to partial fractions.

41. Show that $(\sim p \wedge q) \wedge (q \wedge r) \wedge (\sim q)$ is a contradiction.

42. A railway train 100 meters long is running at the speed of 30kmph. In what time will it pass (a) A man standing near the line (b) A bridge 100 meters long.

43. Samsung Company which manufactures LCD TV. The first lot 10 unit was competed in 1400 labour hours. Find each subsequent lot, the commutative production was doubled and it is observed that 90% learning effect applies to all labour related cost. The anticipated production is 320 unit of LCD TV find the total labour hours required to manufacture 320 units and also find the total labour cost at Rs 20 per hour.

44. Solve the LPP graphically:

    Maximise Z= 2x+3y

    Subject to : x + y ≤ 400

    2x + y ≤ 600, x, y ≥ 0.

45. In any triangle ABC, prove that Sin2A + Sin2B – Sin2C = 4 Cos A cos B Sin C

46. Find the equation of circle passing through the points (-1, 2) and (3,-2) and has its centre on x=2y.

47. If $y = \log (x + \sqrt{x^2 + 1})$. show that $(x^2 + 1) y_2 + xy_1 = 0$

48. Find the area enclosed between the curves $y^2 = x$ and $x^2 = y$

PART-E

V. **Answer any one of the following:** $\qquad$ $10 \times 1 = 10$

49. a) Transpot corporation operates bus service between two villages. Data regarding the passenger traffic during the first three days of the week is given below along with the total revenue. The data does not include bus fare charged per child, senior citizen and adults.

	No of passenger travelled			
	Children	Senior Citizen	Adult	Total (Revenue (Rs)
1	10	10	20	90
2	30	20	10	100
3	10	20	30	140

Find the bus fare charged per child, per senior citizen and per adult by using matrix method. (6)

b) Two towers of height 14m and 25m stand on level ground. The angles of elevation of their tops from a point on the line joining their feet are 45^0 and 60^0 respectively. Find the distance between the towers. (4)

50. a) If n is a rational number and 'a' is non-zero real number, then prove that $\displaystyle \lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$

b) Using Binomial theorem find the value of $(1.01)^5$ corrected upto four decimal places. (6+4)