NOTE: 1) 5 Marks is allotted for Maths practical journal
2) 15 Marks for test (attempt any three out of four).
3) You can find solutions in your Maths journals.

Q1. Express the following circuit in symbolic form and write its switching table (5)

![Circuit Diagram]

Q2. Find equations of tangent and normal to the curve \( y = 3x^2 - 4x + 7 \) at the point whose abscissa is 1. (5)

Q3. Find the area enclosed between the circle \( x^2 + y^2 = 1 \) and the line \( x+y=1 \) lying in the first quadrant (5)

Q4. Find the inverse of the matrix \[
\begin{bmatrix}
1 & 2 & 3 \\
1 & 1 & 5 \\
2 & 4 & 7 \\
\end{bmatrix}
\]
by elementary row transformation. (5)

Q5. Calculate the area between the parabolas \( y = x^2 \) and \( x = y^2 \). By using Integration. (5)

Q6. Find the equation of tangent and normal to the following curve at \( t=2 \) where \( x = \frac{1}{t} \) and \( y = t - \frac{1}{t} \) (5)

Q7. Give an alternative arrangement of the following circuit such that the new circuit has two switches.

![Alternative Circuit Diagram]

Q8. Find the vector equation of a line passing through to point \( A (3, 4, 6) \) and perpendicular to the vectors \( 2\hat{i} + 4\hat{j} + 4\hat{k} \) and \( 3\hat{i} + 6\hat{j} + 7\hat{k} \) (5)

Q9. Find the gradient of the curve \( (x+1)(x-1)(x-3) \) at the points where it outs the X axis. Find the equation of tangent at these points. (5)

Q10. Verify Rolle’s Theorem for \( f(x) = x^2 - 5x + 9 \) where \( X \in [1, 4] \) (5)

Q11. Find the inverse of \[
\begin{bmatrix}
4 & -5 & -11 \\
1 & -3 & 1 \\
2 & 3 & -7 \\
\end{bmatrix}
\]
by adjoint method. (5)
Q12. Find the equation of the plane passing through the point (-1,2,1) perpendicular to the line joining the points (-3,1,2) and (2,3,4)  

Q13. A fair coin is tossed 9 times. Find the probability that is shows (i) exactly 5 heads,  
(ii) first 4 tosses are tail and in the last 5 heads.  

Q14. In Δ ABC prove that, \( \sin A - b \sin B = c \sin (A-B) \)  

Q15. A particle moving along the curve \( 6y = x^3 + 2 \) find the points on the curve at  
which \( y \)-co-ordinates is changing 8 times as fast as the \( x \)-coordinate.  

Q16. The cost of 4 kg of potato, 3 kg wheat and 2 kg rice is Rs. 60. The cost of 1 kg potato, 2 kg wheat and 3 kg rice is Rs. 45. The cost of 6 kg potato, 2 kg wheat and 3 kg rice is Rs. 70. Find the cost of each item per kg by matrix, adjoint method.  

Q17. The law of motion of a particle is given by \( s = t^3 - 2t^2 + 5t + 2 \). Find the velocity and acceleration at \( t = 2 \).  

Q18. Examine for maxima & minima, of a function \( 2x^3 + 9x^2 - 24x + 18 \). Also find the maximum & Minimum values of \( f(x) \).  

Q19) Find the value of \( \tan^{-1} \sqrt{3} - \sec^{-1} (-2) \)  

Q20) Divide the number 84 into two parts such that the product of one part and square of other is maximum.