Q.P. Code :09451

[Time: 3 Hours] **[Marks:70]**

Please check whether you have got the right question paper.

N.B:
1. **All** questions are **compulsory**.
2. **Use** of **simple calculator** is **allowed**.
3. **Figures** to the **right** indicate **full marks**.

Q.1 (A) Attempt any 7 [2 marks each]: **14**

1) The value of $\int_2^5 (3x^2 + 2x + 1)dx$ is:
   a) 411
   b) 141
   c) 142
   d) 35
2) If $\begin{vmatrix} 2 & x \\ 1 & 4 \end{vmatrix} = \begin{vmatrix} x & 6 \\ 2 & 4 \end{vmatrix}$ then the value of x is:
   a) 1
   b) -2
   c) 4
   d) 2
3) The Nth derivative of f(x)=log(2x+1) is:
   a) $y_n = \frac{1}{2(2x+1)}$
   b) $y_n = \frac{(1)^{n-1}(n-1)!2^n}{(2x+1)^n}$
   c) $y_n = \frac{(1)^n(n)!2^n}{(2x+1)^n}$
   d) $y_n = \frac{(1)^n(n-1)!2^n}{(2x+1)^n}$
4) For f(x,y)=x^2+xy+ y^2, the value of $\frac{\partial^2 f}{\partial x^2}$ is:
   a) 2x+y
   b) 1
   c) 2
   d) x+2y
5) If y=2x, then Δy by taking h=1 is:
   a) 4
   b) 2
   c) 3
   d) 1
6) If A=$\begin{bmatrix} k & k & 4 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$ is a singular matrix, then value of k is:
   a) 5/4
   b) 5/2

[P.T.O]

c) 15/4
d) 40/8

7) The solution of the differential equation x dx+y dy=0 is:
   a) $x^2+ y^2=c$
   b) $x^2- y^2=c$
   c) x+y=c
   d) x-y=c
8) The value of $\int logx\ dx$ is:
   a) xlogx-1+c
   b) xlogx+1-c
   c) x(logx+1)+c
   d) x(logx-1)+c
9) General solution for the differential equation $(D^3-6D^2+9D)y=0$ is:
   a) $(c_1x+c_2)\ e^{3x}+c_3$
   b) $c_1e^{3x}+c_2e^{3x}+c_3e^{0x}$
   c) $(c_1x+c_2x)e^{3x}+c_3$
   d) $(c_1x+c_2)\ e^{3x}+c_3e^{3x}$

(B) Attempt any 1: **1**

10) The value of $\int_{-2}^{2} x^5 dx$ is:
   a) 16/3
   b) 8/3
   c) 0
   d) 3/16
11) Which of the following is not a homogeneous differential equation?
   a) f(x,y)=2x-9y
   b) $f(x,y)=3x^2-7y^2$
   c) $f(x,y)=x^2+3y^2-1$
   d) a and b

Q.2 (A) Attempt any two (4 marks each) **8**

1) Find the N^{th} derivative of $y=\frac{2x+1}{x^2+3x+2}$
2) Using Maclaurin's series, give the expansion of f(x)=cosx
3) Examine the function f(x,y)=xy(3-x-y) for maxima and minima.

(B) Attempt any one (3 marks) **3**

1) State Roil's Mean Value Theorem. Use it to verify for $f(x)=x^2-5x+6$ in [2,3]
2) Differentiate the equation: $(1+x^2)y_2-xy_1+y=0$, n times w.r.t.x.

Q.3 (A) Attempt any two (4 marks each) **8**

1) Obtain the reduction formula for $\int_0^{\frac{\pi}{2}} Sin^n x\ dx$, hence evaluate $\int_0^{\frac{\pi}{2}} Sin^{10} x\ dx$

2) Find the whole area of the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$

3) Evaluate : $\int_0^{\frac{\pi}{2}} Sin^4x\ dx$

(B) Attempt any one (3 marks) **3**

1) The portion of the curve $x^2=9y$ between x=0 and x=3 is revolved about x-axis. Find the volume of solid of revolution.

2) By using the properties of Definite integral, Prove $\int_0^{\pi/2}\left(\frac{cosx}{sinx+cosx}\right)dx=\frac{\pi}{4}$

Q.4 (A) Attempt any two (4 marks each) **8**

1) By using the Adjoint method, find the inverse of the matrix A= $\begin{bmatrix}2 & -1 & 3\\ 1 & 1 & 1\\ 1 & -1 & 1\end{bmatrix}$

2) Find the Eigen values and one of the Eigen vectors of the matrix: $\begin{bmatrix}2 & -1 & 1\\ 2 & 2 & -1\\ 1 & 2 & -1\end{bmatrix}$

3) Verify Cayley Hamilton theorem for the matrix A= $\begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$

(B) Attempt any one (3 marks) **3**

1) Solve the following equations by Cramer's rule:
x+y=3, y+z=5, x+z=4

2) Find the Rank of the matrix A= $\begin{bmatrix}2 & 3 & 4\\ 4 & 3 & 1\\ 1 & 2 & 4\end{bmatrix}$

Q.5 (A) Attempt any two (4 marks each) **8**

1) Solve $(x^3+y^3)dy=x^2y\ dx$

2) Solve (1-x) dy-(1+y) dx=0. Also find the particular solution, if y=2 when x=1

3) Find the particular solution of $(D^3-D^2-D+1)y=0$, when x=0, y=1 and $\frac{dy}{dx}=0$

(B) Attempt any one (3 marks) **3**

1) Form the differential equation for $y=ae^x+be^{-x}$, where a, b are arbitrary constants.

2) Solve the following homogeneous differential equations: $\frac{dy}{dx}=\frac{xy+y^2}{x^2+xy}$

Q.6 (A) Attempt any two (4 marks each) **8**

1) Using Lagrange's interpolation formula obtain a polynomial which passes via the points (0,5),(1,-1) and (3,13).

2) Given :

x	1	3	5	7	9	11	13
f(x)	5	21	53	101	165	245	341

Find $\int_1^{13} f(x)dx$, using Simpson's 1/3rd rule.

3) Estimate the missing term by using E and Δ from the following:

x	0	1	2	3	4
Y	1	3	9	-	81

(B) Attempt any one (3 marks) **3**

1) Estimate the value of f(x) at x=2.65 from the following data by Newton's forward difference formula.

x	-1	0	1	2	3
f(x)	-21	6	15	12	3

2) Solve $\left(\frac{\Delta^2}{E}\right) x^3$ by taking h=1
