

Multiple Choice Problems [20]

Mark: (a), (b), (c), or (d) for the correct answer for Q1 to Q20.

Q_b	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
ANS																					

Q1. Let: $ydy = -xdx$. The relation $x^2 + y^2 = C^2$ is an

- (a) Explicit solution of the DE , (b) Implicit solution of the DE , (c) Particular solution of the DE ,
 (d) None of these

Q2. Consider the DE: $y'' - y = 0$. The solution $y = c_1e^x + c_2e^{-x}$ is

- (a) One parameter family of solutions,, (b) A three parameter family of solutions, (c) A general solution,
 (d) None of these

Q3. The DE for growth and decay is:

- (a) Linear homogeneous, (b) Exact, (c) Linear non-homogeneous, (d) Non of these

Q4. Half life of a radio active material of initial mass 400 gm is time when the mass left is

- (a) 200 gm, (b) 100 gm, (c) 300 gm, (d) 800 gm

Q5. The DE of orthogonal trajectories of the family of curves: $y = ce^x$ is

- (a) $y' = -y$, (b) $y' = y$, (c) $y' = -1/y$, (d) None of these.

Q6. The orthogonal trajectories of the family of curves $x^2 + y^2 = c^2$, are

- (a) $y^2 = cx$, (b) $y = \pm cx$, (c) $y = cx^2$, (d) None of these.

Q7. If $y_1 = e^{-2x}$ is a solution of $y'' - 3y' - 10y = 0$, then the second solution y_2 is

- (a) $y_2 = xe^{-2x}$ (b) $y_2 = e^{2x}$, (c) $y_2 = e^{5x}$, (d) None of these

Q8. Undetermined coefficient method cannot be applied if the free term $f(x)$ in the DE is

- (a) $e^{x+1} \sin x$, (b) \sqrt{x} , (c) $x^4 \cos 2x$, (d) $e^x - x \sin x + 5 \sin x \cdot \cos x$.

Q9 The IVP $y'' + 9y = x^2$, $y(0) = 0$, $y'(0) = 0$

- (a) May have no solution, (b) Has a unique solution, (c) May have many solutions

Q10. The DE $(1 - x^2)y'' + xy' + y = 0$ has

- (a) Two singular points, (b) One singular point, (c) Three singular points, (d) None of these

Q11. The singular points of the DE $x^2y'' + (4 - x^2)y' + 2y = \cos x$ are:

- (a) $x = +2, x = -2$, (b) $x = 0$, (c) $x = 0, x = +2, x = -2$, (d) No singular point

Q12. The function $|x|(\sin x)^2 + \cos x$ is an:

- (a) odd function, (b) Even function, (c) Neither even nor odd,

- Q.13.** The DE in y that can be obtained from the system: $\begin{cases} x' - y = t \\ x + y'' = 2t \end{cases}$ is
 (a) Of order 1 , (b) Of order 2 , (c) Of order 4 , (d) Of order 3.
- Q.14.** For the system: $\begin{cases} x' - y = 0 \\ y' - 4x = 0 \end{cases}$ $x(t)$ is:
 (a) $c_1 e^{2t} + c_2 e^{-2t}$, (b) $c_1 e^{4t} + c_2 e^{-4t}$, (c) $c_1 \sin 2t + c_2 \cos 2t$, (d) None of these
- Q.15.** At $x = 0$, the Fourier series of the function $f(x) = \begin{cases} 0, & \text{if } -\pi < x < 0 \\ \pi - x, & \text{if } 0 \leq x < \pi \end{cases}$ converges to
 (a) $1/2$, (b) 0 , (c) $\pi/2$, (d) None of these
- Q. 16.** The norm ($\|f\|$) of the function $f(x) = x^2$ on the interval $[-2,2]$ is
 (a) $8/\sqrt{5}$, (b) $4/\sqrt{3}$, (c) $3/\sqrt{2}$, (d) None of these
- Q. 17.** The Fourier series for an even function contains only
 (a) Terms in $\sin e$, (b) Terms in $\cos ine$, (c) Terms in $\sin e$ and $\cos ine$
- Q. 18.** The functions $f(x) = x$ and $g(x) = x^2$ are orthogonal on the interval
 (a) $[-1,2]$, (b) $[0,1]$, (c) $[-3,3]$, (d) None of these
- Q. 19.** The auxiliary (Characteristic) equation for the DE: $x^2 y'' - 4xy' + 2y = 0$ is
 (a) $m^2 - 5m + 2 = 0$, (b) $m^2 - 4m + 1 = 0$, (c) $m^2 - 4m + 2 = 0$, (d) None of these
- Q. 20.** If y_1 is a given solution of a given DE, then to use the reduction of order method, we use the substitution
 (a) $u = \frac{y}{y_1}$, (b) $y = \frac{y_1}{u}$, (c) $u = yy_1$, (d) None of these

Q. 21. Solve the DE: $y' = \frac{xy^2 - \cos x \cdot \sin x}{y(1-x^2)}$

[5]

Q. 22. The initial population of 10000 of a town is doubled in 4 years. What will be the population after 10 years if the rate growth of population is directly proportional to the population at any time? [5]

Q. 23. Find only the form of the particular solution (Do not compute the coefficients in y_p) for the DE:

$$y''' - y'' = 3e^x + \sin x + x^2 \quad [4]$$

Q.24. find the general solution of the DE: $x^2 y'' - 2xy' + 2y = -x^2 \ln x$ [5]

Q. 25. Use power series method to find the general solution about the ordinary point $x_0 = 0$ of the DE
 $(1 - x^2)y'' - 2xy' + 2y = 0$.

[6]

Q. 26. Find the Fourier series for the function of period 2: $f(x) = x^2$, $-1 < x < 1$. Deduce that

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} = \frac{\pi^2}{12} \quad [5]$$