ONE TWO ACADEMY

Unit Test - 10

TOTAL:- 45 **GENERAL MATHEMATICS** **STD XII**

Ordinary Differential Equations

Choose the correct answer:- ***5 x 1 = 5***

1)The degree and order of the differential equation is $\frac{dy}{dx} + \frac{dx}{dy} = 0$ is

(a) 2 , not defined (b) 1 , 2 (c) 2 , 2 (d) 2 ,1

2) The order of the differential equation of all circle with centre (h,k) and radius 'a' is ……

(a) 2 (b) 3 (c) 4 (d) 1

3. The solution of the differential equation $2x\frac{dy}{dx} - y = 3$ represents

(a) straight lines (b) circles (c) parabola (d) ellipse

4. The number of arbitrary constants in the particular solution of a differential equation of third order is ..

(a) 3 (b) 2 (c) 1 (d) 0

5. If cos x is an integrating factor of the differential equation $\frac{dy}{dx}$ + P y = Q then P = _____.

(a) - cot x (b) cot x (c) tan x (d) - tan x

Answer any 4 of the following (Question no 8 is compulsory):- ***5 x 2 = 10***

6)Find the order and degree of y'' + x = $\sqrt{y + y'}$.

7) Assume that a spherical rain drop evaporates at a rate proportional to its surface area. Form a differential equation involving the rate of change of the radius of the rain drop.

8)Find the DE of the family of all non-vertical lines in a plane.

9)Find the DE corresponding to the family of curves represented but he equation $y = Ae^{8x} + Be^{-8x}$, where A and B are arbitrary constants.

10)Show that $y = 2x^2$ is a solution for $xy' = 2y$.

11)Solve $\frac{dy}{dx} = (3x + y + 4)^2$.

Answer any 4 of the following (Question no 21 is compulsory):- ***7 x 3 = 21***

12)Find the DE of the family of circles passing through the origin and having their centres on the. x-axis.

13)The slope of the tangent to the curve at any point is the reciprocal of four times the ordinate at that point. The curve passes through (2,5). Find the equation of the curve.

14)verify that the function $y = ax^2 + bx + c$ is a solution of the DE y'' = 2a.

15)Solve the following $\frac{dy}{dx} = \sqrt{\frac{1 - y^2}{1 - x^2}}$.

16)Show that $y = e^{-x} + mx + n$ is a solution of the differential equation $e^{x}\left(\frac{d^2y}{dx^2}\right) - 1 = 0$.

17)Solve $\frac{dy}{dx} + 2y = e^{-x}$.

Answer the following:- **4 x 5 = 20**

18). Form the DE of all straight lines touching the circle $x^2 + y^2 = r^2$.

[OR]

Solve $\frac{dy}{dx} = \tan^2(x+y)$.

19)Solve $(x^3 + y^3)\,dy - x^2y\,dx = 0$.

[OR]

$x \sin x \frac{dy}{dx} + (x \cos x + \sin x)\, y = \sin x$.

20) A pot of boiling water at 100°C is removed from a stove at the time t = 0 and left to cool in the kitchen. After 5 minutes, the water temperature has decreased to 80°C, and another 5 minutes later it dropped to 65°C. Determine the temperature of the kitchen.

[OR]

The growth of a population is proportional to the number present. If the population of a colony doubles in 50 years, in how many years will the population become triple?

21)A tank initially contains 50 litres of pure water. Starting at time t = 0 a brine containing with 2 grams of dissolved salt per litre flows into the tank at the rate of 3 litres per minute. The mixture is kept uniform by stirring and the well-stirred mixture simultaneously flows out of the tank at the same rate. Find the amount of salt present in the tank at any time t > 0 .

[OR]

Assume that the rate at which radioactive nuclei decay is proportional to the number of such nuclei that are present in a given sample. In a certain sample 10% of the original number of radioactive nuclei have undergone disintegration in a period of 100 years. What percentage of the original radioactive nuclei will remain after 1000 years?

All the best