

**Model Question Paper**  
**Differential Equations - Part I**

12th Standard

**Business Maths**

Reg.No. : 

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I. Answer all the questions.

II. Use blue pen only.

III. Question number 15 is compulsory.

Time : 01:30:00 Hrs

Total Marks : 85

5 x 1 = 5

**Part-A**

- 1) The differential equation of straight lines passing through the origin is  
 (a)  $x \frac{dy}{dx} = y$  (b)  $\frac{dy}{dx} = \frac{x}{y}$  (c)  $\frac{dy}{dx} = 0$  (d)  $x \frac{dy}{dx} = \frac{1}{y}$
- 2) The degree and order of the differential equation  $\frac{d^2y}{dx^2} - 6\sqrt{\frac{dy}{dx}} = 0$  are  
 (a) 2 and 1 (b) 1 and 2 (c) 2 and 2 (d) 1 and 1
- 3) The order and degree of the differential equation  $\left(\frac{dy}{dx}\right)^2 - 3\frac{d^3y}{dx^3} + 7\frac{d^2y}{dx^2} + \frac{dy}{dx} = x + \log x$  are  
 (a) 1 and 3 (b) 3 and 1 (c) 2 and 3 (d) 3 and 2
- 4) The order and degree of  $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{2}{3}} = \frac{d^2y}{dx^2}$  are  
 (a) 3 and 2 (b) 2 and 3 (c) 3 and 3 (d) 3 and 2
- 5) The solution of  $x dy + y dx = 0$  is  
 (a)  $x+y=c$  (b)  $x^2 + y^2 = c$  (c)  $xy=c$  (d)  $y=cx$

**Part-B**

- 6) Find the order and degree of the following :  $x^2 \frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + y = \cos x$
- 7) Find the order and degree of the following :  $\frac{d^3y}{dx^3} - 3\left(\frac{d^2y}{dx^2}\right)^2 + 5 \frac{dy}{dx} = 0$
- 8) Find the order and degree of the following :  $\frac{d^2y}{dx^2} - \sqrt{\frac{dy}{dx}} = 0$
- 9) Find the order and degree of the following :  $\left(1 + \frac{d^2y}{dx^2}\right)^{\frac{1}{2}} = \frac{dy}{dx}$
- 10) Find the order and degree of the following :  $\left(1 + \frac{dy}{dx}\right)^{\frac{1}{3}} = \frac{d^2y}{dx^2}$

**B** **I**  $x_2$   $x^2$

5 x 6 = 30

**Part-C**

- 11) The rate of increase in the cost  $C$  of ordering and holding as the size  $q$  of the order increases is given by the differential equation  $\frac{dC}{dq} = \frac{C^2 + q^2}{2Cq}$ . Find the relationship between  $C$  and  $q$  if  $C = 4$  when  $q = 2$ .
- 12) The total cost of production  $y$  and the level of output  $x$  are related to the marginal cost of production by the equation  $\frac{dy}{dx} = \frac{24x^2 - y^2}{xy}$ . What is the total cost function if  $y = 4$  when  $x = 2$ ?
- 13) Solve :  $(D^2 - 5D + 6)y = e^{-x} + 3e^{-2x}$
- 14) Solve :  $(15D^2 - 2D - 1)y = e^{\frac{x}{3}}$
- 15) a) Suppose that  $Q_d = 30 - 5P + 2\frac{dP}{dt} + \frac{d^2P}{dt^2}$  and  $Q_s = 6 + 3P$ . Find the equilibrium price for market clearance.

5 x 10 = 50

**(OR)**

- b) Solve the differential equation  $(x^2 + y^2)dx = 2xydy$ .

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