Quiz-5

Chapter- Ordinary Differential Equation

Note: Attempt all questions. Each question carries 2 marks. Choose the correct/most suitable answer.

1. What is the order and degree of a differential equation $cos(\frac{d^2y}{dx^2}) - e^x = 0$, $x \in [-1, 0]$?

   a. Order not defined, First Degree
   b. Second order, Degree not defined
   c. Second order, First Degree
   d. Both order and degree not defined.

2. The displacement $x(t)$ of a particle is governed by differential equation $\frac{d^2x}{dt^2} + \frac{dx}{dt} + bx = c\frac{dx}{dt}, b > 0$. For what values of b and c the motion of the particle is oscillatory?

   a. $(1 - 2\sqrt{b}) > c$
   b. $(1 - 2\sqrt{b}) \geq c$
   c. $(1 - 2\sqrt{b}) < c < (1 + 2\sqrt{b})$
   d. $(1 + 2\sqrt{b}) \leq c$

3. Let $y_1 = e^{3t}$ and $y_2 = te^{3t}$. Which of the following statements is true about $W(y_1, y_2)$, the Wronskian of y_1 and y_2?

   a. $W(y_1, y_2) = e^{6t}$, therefore y_1 and y_2 are linearly independent
   b. $W(y_1, y_2) = e^{6t}$, therefore y_1 and y_2 are linearly dependent
   c. $W(y_1, y_2) = 0$, therefore y_1 and y_2 are linearly dependent
   d. $W(y_1, y_2) = 0$, therefore y_1 and y_2 are linearly independent

4. The Particular integral of the differential equation $\frac{d^2y}{dx^2} + 2y = sin\sqrt{2}x$ is

   a. $-\frac{x}{2\sqrt{2}}cos\sqrt{2}x$
   b. $\frac{cos\sqrt{2}x}{2\sqrt{2}}$
   c. $\frac{x}{2\sqrt{2}}cos\sqrt{2}x$
   d. $\frac{x}{2\sqrt{2}}sin\sqrt{2}x$

5. Consider the 2nd-order non-homogeneous differential equation $y'' - 4y' + 3y = e^{-4t} + t^2$, what is the correct form for a particular integral y_p?.

   a. $y_p = Ae^{-4t} + Bt^2$
   b. $y_p = Ate^{-4t} + Bt^2 + Ct + D$
   c. $y_p = Ae^{-4t} + Bt^2 + Ct + D$
   d. $y_p = At^2e^{-4t} + Bt^2 + Ct + D$

6. The order and degree of the differential equation $y''' + tan^{-1}(1 + y'') + y = 0$ are

   a. $3, 1$
   b. 3, not defined
   c. Both order and degree are not defined.
   d. Can't say anything.

7. The particular integral y_p of the equation $F(D)y = e^{2x}$, where $F(D) = (D-2)^2(D+3)$, is

   a. $y_p = \dfrac{x^2}{10}e^{2x}$
   b. $y_p = \dfrac{x^2}{2}e^{2x}$
   c. $y_p = \dfrac{x^2}{5}e^{2x}$
   d. $y_p = \dfrac{x}{10}e^{2x}$

8. The Solution of $(1 + y^2)dx = (tan^{-1}y - x)dy$ is

   a. $x = tan^{-1}y - 1 + Ce^{-tan^{-1}y}$
   b. $y = tan^{-1}x - 1 + Ce^{-tan^{-1}x}$
   c. $x = tan^{-1}y + Ce^{-tan^{-1}y}$
   d. $y = tan^{-1}x + Ce^{-tan^{-1}x}$

9. Particular integral y_p of the non-homogeneous equation $y'' - 2y' + y = xe^x \sin x$ is

   a. $y_p = e^x(2\cos x + x\sin x)$
   b. $y_p = -e^x(2\cos x + x\sin x)$
   c. $y_p = e^x(x\cos x + 2\sin x)$
   d. $y_p = -e^x(\cos x + x\sin x)$

10. For the IVP $y' = f(x, y)$, IC: $y(x_0) = y_0$, which statement is true-

    a. IVP has a solution then $f(x, y)$ is continuous and bounded in a closed rectangular region R containing (x_0, y_0)
    b. IVP has a solution if the function $f(x, y)$ is continuous and bounded in a closed rectangular region R containing (x_0, y_0)
    c. IVP has a solution if and only if the function $f(x, y)$ is continuous and bounded in a closed rectangular region R containing (x_0, y_0)
    d. IVP has a unique solution if the function $f(x, y)$ is continuous and bounded in a closed rectangular region R containing (x_0, y_0)