IST INTERNAL CC 04

ANSWER ALL THE FOLLOWING QUESTIONS.

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1. The value of the particular integral (PI) of

$$(D^3+1)y = e^{2x}\sin x + e^{\frac{x}{2}}\sin\frac{x\sqrt{3}}{2} \quad is$$

a) $\frac{e^{2x}}{130}(3\sin x + 11\cos x) + \frac{1}{6}xe^{\frac{x}{2}}\left(\sin\frac{x\sqrt{3}}{2} + \sqrt{3}\cos\frac{x\sqrt{3}}{2}\right)$

b) $\frac{e^{2x}}{130}(3\sin x - 11\cos x) - \frac{1}{6}xe^{\frac{x}{2}}\left(\sin\frac{x\sqrt{3}}{2} + \sqrt{3}\cos\frac{x\sqrt{3}}{2}\right)$

c) $\frac{e^{2x}}{130}(11\sin x - 3\cos x) + \frac{1}{6}xe^{\frac{x}{2}}\left(\sqrt{3}\sin\frac{x\sqrt{3}}{2} + \cos\frac{x\sqrt{3}}{2}\right)$

d) none of these

- ○ a
- ○ b
- ○ c
- ○ d

2. By the method of variation of parameter, the value of

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = \frac{e^x}{1+e^x} \quad is$$

a) $y = c_1e^x + c_2e^{2x} + (e^x + e^{2x})\log(1+e^x) - (x+1)e^x - xe^{2x}$

b) $y = c_1e^{-x} + c_2e^{2x} + (e^{-x} + e^{2x})\log(1+e^{-x}) - (x+1)e^{-x} - xe^{2x}$

c) $y = c_1e^x + c_2e^{2x} + (e^x - e^{2x})\log(1-e^x) - (x+1)e^x + xe^{2x}$

d) none of these

- ○ a
- ○ b
- ○ c
- ○ d

3) The value of the power series solution of the differential equation

$$\frac{d^2y}{dx^2} + x^2\frac{dy}{dx} + xy = 0 \quad is$$

a) $y = a_0\left(1 + \frac{1}{6}x^3 + \frac{1}{45}x^6 + \cdots\right) + a_1(x + \frac{1}{6}x^4 + \frac{5}{252}x^7 + \cdots)$

b) $y = a_0\left(1 - \frac{1}{6}x^3 + \frac{1}{45}x^6 - \cdots\right) + a_1(x - \frac{1}{6}x^4 + \frac{5}{252}x^7 - \cdots)$

c) $y = a_0\left(1 - \frac{1}{3}x^3 - \frac{1}{45}x^6 - \cdots\right) + a_1(x - \frac{1}{3}x^4 - \frac{5}{252}x^7 - \cdots)$

d) none of these

- ○ a
- ○ b
- ○ c
- ○ d

4) The regular singular point of the differential equation

$$\frac{d^2y}{dx^2} - \frac{1}{x}\frac{dy}{dx} + \frac{1}{(x-1)^3}y = 0 \quad is$$

a) $x = 0$ b) $x = 1$ c) $x = 2$ d) $x = -1$

- ○ a
- ○ b
- ○ c
- ○ d

5) Using Frobenius method, the series solution of

$$8x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} + y = 0\,, near\ x = 0\ is$$

a) $y = ax + bx^{\frac{1}{2}}$ b) $ax^{\frac{1}{2}} + bx^{\frac{1}{4}}$ c) $ax^3 + bx^2$ d) none of these where a and b are arbitrary constant.

- a
- b
- c
- d

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