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DEPARTMENT OF MATHEMATICS

Question bank for In semester exam

Semester II (2021-2022)

SUB:ENGINEERING MATHEMATICS III

Unit 1

Linear Differential equation with constant coefficients

1. The solution of differential equation $\frac{d^3 y}{dx^3} + y = 0$ is

[A] $c_1 e^x + e^x \left(c_2 \cos \frac{\sqrt{3}}{2} x + c_3 \sin \frac{\sqrt{3}}{2} x \right)$ [B] $c_1 e^{-x} + e^{\frac{1}{2}x} \left(c_2 \cos \frac{1}{2} x + c_3 \sin \frac{1}{2} x \right)$

[C] $c_1 e^{-x} + e^{\frac{1}{2}x} \left(c_2 \cos \frac{\sqrt{3}}{2} x + c_3 \sin \frac{\sqrt{3}}{2} x \right)$ [D] $(c_1 + c_2 x + c_3 x^2) e^{-x}$

2. The solution of differential equation $\frac{d^3 y}{dx^3} + 3 \frac{dy}{dx} = 0$ is

[A] $c_1 + c_2 \cos x + c_3 \sin x$

[B] $c_1 + c_2 \cos \sqrt{3}x + c_3 \sin \sqrt{3}x$

[C] $c_1 + c_2 e^{\sqrt{3}x} + c_3 e^{-\sqrt{3}x}$

[D] $c_1 \cos x + c_2 \sin x$

3. The solution of differential equation $\frac{d^3 y}{dx^3} + \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 12y = 0$ is

[A] $c_1 e^{-3x} + e^x (c_2 \cos \sqrt{3}x + c_3 \sin \sqrt{3}x)$ [B] $c_1 e^{-3x} + (c_2 \cos 3x + c_3 \sin 3x)$

[C] $c_1 e^{3x} + e^{-x} (c_2 \cos \sqrt{3}x + c_3 \sin \sqrt{3}x)$ [D] $c_1 e^{-x} + c_2 e^{-\sqrt{3}x} + c_3 e^{\sqrt{3}x}$

4. Particular Integral $\frac{1}{D+2} e^{-x} \cos e^x$, where $D \equiv \frac{d}{dx}$ is

[A] $e^{-x} \cos e^x$

[B] $e^{-x} \sin e^x$

[C] $e^{-2x} \cos e^x$

[D] $e^{-2x} \sin e^x$

5. Particular Integral $\frac{1}{D+2} e^{-2x} \sec^2 x (1+2 \tan x)$, (use $\tan x = t$) is

[A] $e^{-2x} (1+2 \tan^2 x)$

[B] $e^{-2x} (\tan x + \tan^2 x)$

[C] $e^{2x} (\tan x + 2 \tan^2 x)$

[D] $e^{-2x} (\tan x + \sec x)$

6. Particular Integral $\frac{1}{D+1} \left(\frac{1}{1+e^x} \right)$ where $D \equiv \frac{d}{dx}$ is

[A] $e^x \log(1-e^x)$

[B] $\log(1+e^x)$

[C] $e^x \log(1+e^x)$

[D] $e^{-x} \log(1+e^x)$

7. Particular Integral of Differential equation $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 5y = 10 \sin x$ is

[A] $\frac{8}{3} \sin x$

[B] $\sin x - 2 \cos x$

[C] $4 \sin x + 2 \cos x$

[D] $2 \sin x + \cos x$

8. Particular Integral of Differential equation $(D^2 - 4D + 4)y = e^{2x} x^4$ is

[A] $\frac{x^6}{120} e^{2x}$

[B] $\frac{x^6}{60} e^{2x}$

[C] $\frac{x^6}{30} e^{2x}$

[D] $\frac{x^5}{20} e^{2x}$

9. Particular Integral of Differential equation $\frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + y = e^{-x} \cos x$ is

[A] $e^x \cos x$

[B] $-e^{-x} \sin x$

[C] $-e^{-x} \cos x$

[D] $(c_1 x + c_2) e^{-x}$

10. In solving differential equation $\frac{d^2 y}{dx^2} + 9y = \frac{1}{1 + \sin 3x}$ by method of variation of

parameters, Complimentary function $= c_1 \cos 3x + c_2 \sin 3x$,

Particular Integral $= u \cos 3x + v \sin 3x$ then v is equal to

[A] $\frac{1}{3} \left(-\frac{1}{3} \sec 3x + \frac{1}{3} \tan 3x - x \right)$

[B] $-\frac{1}{9} \log(1 + \sin 3x)$

[C] $\frac{1}{9} \log(1 + \sin 3x)$

[D] $\frac{1}{3} \log \cos x$

11. In solving differential equation $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$ by method of variation of

parameters, Complimentary function $= c_1e^x + c_2e^{-x}$,

Particular Integral $= ue^x + ve^{-x}$ then v is equal to

[A] $e^{-x} - \log(1+e^{-x})$

[B] $-\log(1+e^x)$

[C] $\log(1+e^x)$

[D] $-e^{-x} + \log(1+e^{-x})$

12. In solving differential equation $\frac{d^2y}{dx^2} + 4y = 4\sec^2 2x$ by method of variation of

Parameters, Complimentary function $= c_1 \cos 2x + c_2 \sin 2x$,

Particular Integral $= u \cos 2x + v \sin 2x$ then u is equal to

[A] $\log(\sec 2x + \tan 2x)$

[B] $-\sec 2x$

[C] $\sec 2x + \tan 2x$

[D] $-\left[\log(\sec x + \tan x)\right] + \sin x$

13. For the differential equation $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^5$, particular integral is given by

[A] $\frac{x^5}{6}$

[B] $\frac{x^5}{56}$

[C] $\frac{x^4}{6}$

[D] $-\frac{x^5}{44}$

14. For the differential equation $(2x+3)^2 \frac{d^2y}{dx^2} - 2(2x+3) \frac{dy}{dx} - 12y = 6x$, complimentary

function is given by

[A] $c_1(2x+3)^3 + c_2(2x+3)^{-1}$

[B] $c_1(2x+3)^{-3} + c_2(2x+3)$

[C] $c_1(2x+3)^3 + c_2(2x+3)^2$

[D] $c_1(2x-3)^2 + c_2(2x-3)^{-1}$

15. For the differential equation $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2) \frac{dy}{dx} - 36y = (3x+2)^2$,

Complimentary function is given by

[A] $c_1(3x+2)^3 + c_2(3x+2)^{-3}$

[B] $[c_1 \log(3x+2) + c_2](3x+2)^{-2}$

[C] $c_1(3x+2)^2 + c_2(3x+2)^{-2}$

[D] $c_1(3x-2)^2 + c_2(3x-2)^{-2}$

16. Particular Integral of differential equation $\frac{d^2 y}{dx^2} - 7\frac{dy}{dx} + 6y = e^{2x}$ is

[A] $-\frac{xe^{2x}}{3}$

[B] $-\frac{e^{2x}}{4}$

[C] $\frac{e^{2x}}{4}$

[D] $\frac{e^{2x}}{24}$

17. Particular Integral of Differential equation $(D^2 - 5D + 6)y = 3e^{5x}$ is

[A] $\frac{e^{5x}}{2}$

[B] $\frac{e^{5x}}{6}$

[C] $-\frac{e^{5x}}{14}$

[D] $-\frac{e^{2x}}{2}$

18. Particular Integral of Differential equation $(D^2 - 9)y = e^{3x} + 1$ is

[A] $\frac{3x}{2}e^{3x} - \frac{1}{9}$

[B] $x\frac{e^{3x}}{6} + \frac{3}{8}$

[C] $x\frac{e^{3x}}{6} - \frac{1}{9}$

[D] $xe^{3x} + \frac{1}{8}$

19. For the simultaneous linear differential equations $\frac{dx}{dt} + y = e^t, \frac{dy}{dt} + x = e^{-t}$

solution of x using $D = \frac{d}{dt}$ is obtain from

[A] $(D^2 + 1)x = 2e^t$

[B] $(D^2 - 1)y = -e^t - e^{-t}$

[C] $(D^2 + 1)y = e^{-t} + e^t$

[D] $(D^2 - 1)x = e^t - e^{-t}$

20. For the simultaneous linear differential equations $\frac{du}{dx} + v = \sin x, \frac{dv}{dx} + u = \cos x$ solution

of u , using $D = \frac{d}{dx}$ is obtain from

[A] $(D^2 + 1)u = 2 \cos x$

[B] $(D^2 - 1)u = 0$

[C] $(D^2 - 1)u = \sin x - \cos x$

[D] $(D^2 - 1)v = -2 \sin x$

21. For the simultaneous linear differential equations $\frac{du}{dx} + v = \sin x$, $\frac{dv}{dx} + u = \cos x$, solution

of v , using $D = \frac{d}{dx}$ is obtain from

[A] $(D^2 + 1)v = 0$

[B] $(D^2 - 1)v = -2 \sin x$

[C] $(D^2 - 1)u = 0$

[D] $(D^2 + 1)u = \sin x + \cos x$

22. Particular Integral of Differential equation $(D^4 - m^4)y = \cos mx$ is

[A] $\frac{-x}{4m^3} \cos mx$

[B] $\frac{x}{m^3} \sin mx$

[C] $-x \sin mx$

[D] $\frac{-x}{4m^3} \sin mx$

23. Particular Integral of Differential equation $\frac{d^3 y}{dx^3} - 4 \frac{dy}{dx} = 2 \cosh 2x$ is

[A] $\frac{1}{4} \cosh 2x$

[B] $\frac{x}{8} \cosh 2x$

[C] $\frac{x}{4} \cosh 2x$

[D] $\frac{x}{4} \sinh 2x$

24. Particular Integral of Differential equation $(D^2 + 6D - 9)y = \sinh 3x$ is

[A] $\frac{1}{18} \cosh 3x$

[B] $\frac{1}{2} \cosh 3x$

[C] $\frac{1}{18} \sinh 3x$

[D] $-\frac{1}{18} \cosh 3x$

25 In solving differential equation $\frac{d^2 y}{dx^2} - 6 \frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$ by method of variation of

parameters, Complimentary function $= c_1 x e^{3x} + c_2 e^{3x}$,

Particular Integral $= u x e^{3x} + v e^{3x}$ then u is equal to

[A] $-\frac{2}{x^3}$

[B] $\frac{1}{x}$

[C] $-\frac{1}{x}$

[D] $-\log x$

26 The solution of differential equation $\frac{d^3 y}{dx^3} + 2\frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0$ is (2)

[A] $c_1 + e^{-x}(c_2 x + c_3)$

[B] $c_1 + e^x(c_2 x + c_3)$

[C] $e^{-x}(c_2 x + c_3)$

[D] $c_1 + c_2 e^x + c_3 e^{-x}$

27. In solving differential equation $\frac{d^2 y}{dx^2} - y = e^{-x} \sin e^{-x} + \cos e^{-x}$ by Method of variation of

Parameters, Complimentary function $c_1 e^x + c_2 e^{-x}$,

Particular Integral $= u e^x + v e^{-x}$ then v is equal to

[A] $\frac{1}{2} e^{-x} \sin e^x$

[B] $-\frac{1}{2} e^x \cos e^{-x}$

[C] $e^x e^{e^x}$

[D] $\frac{1}{2} e^{-x} \cos e^x$

28. In solving differential equation $\frac{d^2 y}{dx^2} + y = \sec x$ by method of variation of parameters,

Complimentary function $= c_1 \cos x + c_2 \sin x$, Particular Integral $= u \cos x + v \sin x$ then u is equal to

[A] $-\log \sin x$

[B] x

[C] $-x$

[D] $\log \sin x$

29. The solution of differential equation $\frac{d^3 y}{dx^3} + 6\frac{d^2 y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$ is

[A] $c_1 e^x + c_2 e^{2x} + c_3 e^{3x}$

[B] $c_1 e^{-x} + c_2 e^{2x} + c_3 e^{-3x}$

[C] $c_1 e^{-x} + c_2 e^{-2x} + c_3 e^{-3x}$

[D] $c_1 e^x + c_2 e^{-2x} + c_3 e^{3x}$

30 The solution of differential equation $\frac{d^3 y}{dx^3} - \frac{d^2 y}{dx^2} + 4\frac{dy}{dx} - 4y = 0$ is

[A] $(c_1 + c_2 x)e^{-2x} + c_3 e^{-x}$

[B] $c_1 e^x + c_2 \cos 4x + c_3 \sin 4x$

[C] $c_1 e^x + c_2 \cos 2x + c_3 \sin 2x$

[D] $c_1 e^x + c_2 e^{2x} + c_3 e^{-2x}$

31] The solution of differential equation $\frac{d^3 y}{dx^3} - 7 \frac{dy}{dx} - 6y = 0$ is (2)

[A] $c_1 e^x + c_2 e^{2x} + c_3 e^{3x}$

[B] $c_1 e^{-x} + c_2 e^{-2x} + c_3 3^{6x}$

[C] $c_1 e^{-x} + c_2 e^{2x} + c_3 e^x$

[D] $c_1 e^{-x} + c_2 e^{-2x} + c_3 e^{3x}$

32] . Particular Integral $\frac{1}{D+1} \sin e^x$, where $D \equiv \frac{d}{dx}$ is (2)

[A] $-e^{-x} \sin e^x$

[B] $e^x \cos e^x$

[C] $-e^{-x} \cos e^x$

[D] $e^{-x} \cos e^x$

33] . Particular Integral $\frac{1}{D+1} \left(\frac{1}{1+e^x} \right)$ where $D \equiv \frac{d}{dx}$ is (2)

[A] $e^x \log(1-e^x)$

[B] $\log(1+e^x)$

[C] $e^x \log(1+e^x)$

[D] $e^{-x} \log(1+e^x)$

34] . Particular Integral $\frac{1}{D+2} e^{-x} e^{e^x}$ where $D \equiv \frac{d}{dx}$ is

[A] $e^{2x} e^{e^x}$

[B] $e^{-2x} e^{e^x}$

[C] e^{e^x}

[D] $e^{-x} e^{e^x}$

35] Particular Integral of Differential equation $(D^2 + 1)y = \sin x$ is

[A] $-\frac{x}{2} \cos x$

[B] $-\frac{x}{4} \cos x$

[C] $-\frac{x}{2} \sin x$

[D] $-\frac{1}{2} \cos x$

36] Solution of symmetric simultaneous DE $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$ is (1)

A) $x = c_1 y, y = c_2 z$

B) $x - y = c_1 z, y - z = c_2 x$

C) $x + y = c_1, y + z = c_2$ D) $x + y = c_1, y - z = c_2$

37]. Considering the first two ratio of the symmetrical simultaneous DE $\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2 y^2 z^2}$, one of the relation in the solution is DE is

A) $\frac{1}{x} - \frac{1}{y} = c$ B) $x - y = c$ C) $x^2 - y^2 = c$ D) $x^3 - y^3 = c$

38] Considering the first and third ratio of the symmetrical simultaneous DE $\frac{xdx}{y^3 z} = \frac{dy}{x^2 z} = \frac{dz}{y^3}$ one of the relation in the solution of DE is

A) $x^2 - z^2 = c$ B) $x^4 - y^4 = c$ C) $x^3 - z^3 = c$ D) $x - z = c$

39] Using a set of multiplier as 1, y, z the solution of DE $\frac{xdx}{z^2 - 2yz - y^2} = \frac{dy}{y + z} = \frac{dz}{y - z}$ is

A) $x^2 + y^2 + z^2 = c$ B) $x + \frac{y^2}{2} + \frac{z^2}{2} = c$ C) $x + y + z = c$ D) $x + y^2 + z^2 = c$

40] Using a set of multiplier as x, y, z the solution of DE $\frac{dx}{3z - 4y} = \frac{dy}{4x - 2z} = \frac{dz}{2y - 3x}$ is (2)

A) $x^3 + y^3 + z^3 = c$ B) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = c$ C) $x + y + z = c$ D) $x^2 + y^2 + z^2 = c$

1.C	2.B	3.A	4.D	5.B	6.D	7D	8C	9C	10C
11B	12B	13A	14A	15C	16B	17A	18C	19D	20B
21B	22D	23C	24A	25C	26A	27B	28C	29C	30C
31D	32C	33D	34B	35A	36A	37D	38A	39A	40D