

D6BMT2004

Reg. No.....

Name:

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(Regular / Improvement / Supplementary)

MATHEMATICS

GMAT6B13T: DIFFERENTIAL EQUATIONS

Time: 2 $\frac{1}{2}$ Hours

Maximum Marks: 80

SECTION A: Answer the following questions. Each carries two marks.
(Ceiling 25 Marks)

1. Give example of a second order first degree linear differential equation.
2. Solve $y' = x(1 + y)$.
3. Check whether $\frac{dy}{dx} = \frac{by - ax}{bx - ay}$ is exact or not.
4. State existence and uniqueness theorem for first order linear differential equations.
5. Determine whether functions e^t and e^{2t} are linearly independent or not on an arbitrary interval.
6. State Principle of Superposition.
7. Find the general solution of $y'' - y - 2y = 6e^t$.
8. Find the general solution of $4y'' + 4y' - 3y = 0$.
9. Find $L\{\sin 2t - \sin 3t\}$.
10. Find $L\{t \cos \omega t\}$.
11. Find $L^{-1}\left\{\frac{s^2}{(s-2)^3}\right\}$
12. Evaluate $L\{e^t * \sin t\}$
13. Determine whether $x^3 - 2x$ is odd, even or neither
14. Find a_0 in the Fourier series expansion of $f(x) = x, 0 < x < 2$.
15. Define One dimensional wave equation.

SECTION B: Answer the following questions. Each carries five marks.
(Ceiling 35 Marks)

16. Apply method of variation of parameter to solve the differential equation $y' - \frac{2}{t}y = t^2 \cos 3t$.
17. Using Picard's method solve initial value problem $y' = t + y, y(0) = 1$.

(PTO)

18. Solve the initial value problem $y'' + 5y' + 6y = 0$, $y(0) = 2$, $y'(0) = 3$.
19. Find the general solution of $x^2y'' - 4xy' + 6y = 0$, $x > 0$.
20. Solve the integral equation using Laplace transform $y(t) = t + \int_0^t y(u) \sin(t - u) du$.
21. Find the inverse Laplace transform of $\frac{3s + 1}{(s - 1)(s^2 + 1)}$.
22. Expand $f(x) = x^2$, $0 < x < L$ in a cosine series.
23. Find solution of $u_x = 2u_y + u$ by separating variables.

SECTION C: Answer any two questions. Each carries ten marks.

24. Solve $y^2y' - y^3 \tan x = \sin x \cos^2 x$.
25. Find the general solution of $y'' - 2y' + y = \frac{e^t}{t^3}$.
26. Solve $y'' - 3y' + 2y = 4e^{2t}$, $y(0) = -3$, $y'(0) = 5$ using Laplace transform.
27. Find the Fourier series of the function $f(x)$, where $f(x) = \begin{cases} x & \text{if } -\frac{\pi}{2} < x < \frac{\pi}{2} \\ \pi - x & \text{if } \frac{\pi}{2} < x < \frac{3\pi}{2} \end{cases}$.

(2 × 10 = 20 Marks)