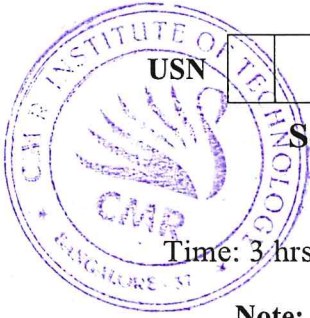


CBCS SCHEME



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15MAT21

Second Semester B.E. Degree Examination, Aug./Sept.2020

Engineering Mathematics - II

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- Solve $y''' + y'' + y' + y = e^{3x+4} + \sin x$ by inverse differential operator method. (06 Marks)
 - Solve $y'' + 16y = x \sin 3x$ by inverse differential operator method. (05 Marks)
 - Solve $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$ by the method of variation of parameters. (05 Marks)

OR

- Solve $y'' + 4y' + 4y = 3 \sin x + \cos 4x$ by inverse differential operator method. (06 Marks)
 - Solve $y'' + 2y = x^2 e^{3x} + e^x \cos 2x$ by inverse differential Operation method. (05 Marks)
 - Solve $y'' + y' - 2y = x + \sin x$ by the method of undetermined coefficients. (05 Marks)

Module-2

- Solve $x^3 y''' + 2x^2 y'' + 2y = 10(x + \frac{1}{x})$. (06 Marks)
 - Solve $y = x(p + \sqrt{1+p^2})$ where $p = \frac{dy}{dx}$. (05 Marks)
 - Find the general and singular solution of the equation $y = xp + p^2$. (05 Marks)

OR

- Solve $(2x + 1)^2 y'' - 2(2x + 1) \frac{dy}{dx} - 12y = 3(2x + 1)$. (06 Marks)
 - Solve $y = 3px + 6p^2 y^2$, solving for x. (05 Marks)
 - Find the general and singular solution of $y = px - \sqrt{1+p^2}$. (05 Marks)

Module-3

- Obtain a partial differential equation by eliminating arbitrary constants in the equation $z = xy + y \sqrt{x^2 - a^2} + b$. (06 Marks)
 - Solve $\frac{\partial^2 z}{\partial x^2} = x + y$ given that $z = y^2$ when $x = 0$ and $\frac{\partial z}{\partial x} = 0$, when $x = 2$. (05 Marks)
 - Solve the one dimensional wave equation $c^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ by the method of separation of variables. (05 Marks)

OR

- Form a partial differential equation by eliminating arbitrary function from the equation $xyz = f(x + y + z)$. (06 Marks)
 - Solve $\frac{\partial^2 z}{\partial y^2} + z = 0$, given that $z = \cos x$ and $\frac{\partial z}{\partial y} = \sin x$ when $y = 0$. (05 Marks)
 - Solve the one dimensional heat equation $c^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$, by the method of separation of variables. (05 Marks)

Module-4

- 7 a. Evaluate $\int_0^1 \int_0^2 \int_1^2 xyz^2 dx dy dz$. (06 Marks)
- b. Evaluate by changing the order of integration $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$. (05 Marks)
- c. Prove that $\beta(m, n) = \int_0^{\infty} \frac{x^{m-1}}{(1+x)^{m+n}} dx$, $m > 0$, $n > 0$. (05 Marks)

OR

- 8 a. Evaluate $\int_0^{\pi/2} \int_0^{a \sin \theta} \int_1^{\left(\frac{a^2-r^2}{a}\right)} r dz dr d\theta$. (06 Marks)
- b. Change the order of integration and evaluate $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dy dx$. (05 Marks)
- c. Prove that $\Gamma(n) = 2 \int_0^{\infty} e^{-t^2} t^{2n-1} dt$. (05 Marks)

Module-5

- 9 a. Find the Laplace transform of
 i) $t \sin t$ ii) $\left(\frac{\cos 6t - \cos 4t}{t}\right)$. (06 Marks)
- b. Find $L[f(t)]$, if $f(t) = \begin{cases} t, & 0 < t \leq a \\ (2a-t), & a < t \leq 2a \end{cases}$, where $f(t+2a) = f(t)$. (05 Marks)
- c. Express $f(t) = \begin{cases} 1, & 0 < t \leq 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2 \end{cases}$
 in terms of unit step function and find its Laplace transform. (05 Marks)

OR

- 10 a. Find i) $L^{-1} \left[\frac{s}{(s-1)(s^2+4)} \right]$ ii) $L^{-1}[\tan^{-1} s]$. (06 Marks)
- b. Using Convolution theorem find $L^{-1} \left[\frac{s}{(s^2+1)(s^2+4)} \right]$. (05 Marks)
- c. Solve $y'' + 4y' + 3y = e^{-t}$ using Laplace transform, given that $y(0) = 1$, $y'(0) = 1$. (05 Marks)
