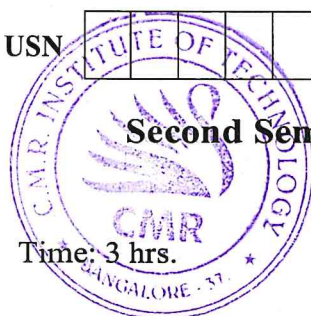


CBCS SCHEME

15MAT21

USN

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Second Semester B.E. Degree Examination, July/August 2021 Engineering Mathematics – II

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Solve : $\frac{d^3y}{dx^3} + 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 6e^{-x} + 7$. (06 Marks)
- b. Solve : $(D^2 - 4D + 13)y = e^{2x} \cos 3x$. (05 Marks)
- c. Solve : $y''' + y' = x^2 + e^{3x}$ by using the method of undetermined co-efficients. (05 Marks)
- 2 a. Solve : $\frac{d^2x}{dt^2} - 4\frac{dx}{dt} + 13x = x^2$. (06 Marks)
- b. Solve : $y'' - 2y' + y = xe^x \sin x$. (05 Marks)
- c. Solve : $(D^2 + 1)y = \operatorname{cosec}x \cdot \cot x$ using method of variation of parameter. (05 Marks)
- 3 a. Solve : $x^2y''' + 3xy'' + y' = x^2 \log x$. (06 Marks)
- b. Solve : $xyp^2 + p(3x^2 - 2y^2) - 6xy = 0$. (05 Marks)
- c. Solve : $p^3 - 4xyp + 8y^2 = 0$. (05 Marks)
- 4 a. Solve : $(1 + 2x)^2 y'' - 2(1 + 2x)y' - 12y = 6x$. (06 Marks)
- b. Solve : $y + px = p^2 x^4$. (05 Marks)
- c. Reduce to Clairaut's form using substitution $x^2 = u$ and $y^2 = v$ and solve : $(px - y)(x - py) = 2p$. (05 Marks)
- 5 a. Construct partial differential equation of, $z = yf(x) + xg(y)$. (06 Marks)
- b. Solve : $\frac{\partial^2 z}{\partial t \partial x} = e^{-2t} \cdot \cos 3x$ subject to the conditions $z(x, 0) = 0$ and $z_t(0, t) = 0$. (05 Marks)
- c. Obtain various possible solution of $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$. (05 Marks)
- 6 a. Form a partial differential equation by eliminating the arbitrary function from, $\phi[x^2 + y^2 + z^2, z^2 - 2xy] = 0$. (06 Marks)
- b. Solve : $Z_{xx} + 4z = 0$ given that at $x = 0$, $z = e^{2y}$ and $z_x = 2$. (05 Marks)
- c. Derive one-dimensional wave equation in the form $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 7 a. Evaluate : $\iint_R y \, dx \, dy$ where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$. (06 Marks)
- b. Evaluate : $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} \, dz \, dy \, dx$. (05 Marks)
- c. Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. (05 Marks)
- 8 a. Evaluate $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy \, dx$ by changing order of integration. (06 Marks)
- b. Find the volume generated by the revolution of the cardioids $r = a(1 + \cos\theta)$. (05 Marks)
- c. Show that $\int_0^{\pi/2} \sqrt{\sin\theta} \, d\theta \times \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} = \pi$. (05 Marks)
- 9 a. Find (i) $L[\cos t \cos 2t \cos 3t]$. (ii) $L\left[\frac{e^{at} - e^{bt}}{t}\right]$ (06 Marks)
- b. Find $L[f(t)]$ of
- $$f(t) = \begin{cases} E \sin \omega t & 0 \leq t < \frac{\pi}{\omega} \\ 0 & \frac{\pi}{\omega} \leq t \leq \frac{2\pi}{\omega} \end{cases}$$
- where $f\left(t + \frac{2\pi}{\omega}\right) = f(t)$.
- Q, E and ω are constant. (05 Marks)
- c. Find the inverse Laplace transform of, $F(s) = \frac{4s + 5}{(s+1)^2(s+2)}$. (05 Marks)
- 10 a. Find (i) $L[e^{-t}(2 \cos 5t - 3 \sin 5t)]$ (ii) $L[t^3 \cosh at]$ (06 Marks)
- b. Using convolution theorem, find inverse Laplace transform of $\frac{1}{(s+1)(s^2+1)}$. (05 Marks)
- c. Solve using Laplace transform, $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ given $y(0) = 0$ and $y'(0) = 0$. (05 Marks)
