CBCS SCHEME

USN

15MAT21

Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 80

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

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.

Module-1

1 a. Solve $\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=e^{-x}+\sin 2x$ by inverse differential operator method. **(06 Marks)**

b. Solve $y''+y'+y=x^2+x+1$ by inversed differential operator method. **(05 Marks)**

c. Solve $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=\frac{e^x}{x}$ by the method of variation of parameters. **(05 Marks)**

OR

2 a. Solve $y''+2y'+y=x\sin x$ by inverse differential operator method. **(06 Marks)**

b. Solve $(D^2-4D+3)y=2xe^{3x}$ by inverse differential operator method. **(05 Marks)**

c. Solve $(D^2-3D+2)y=x^2+e^x$ by the method of undetermined co-efficient. **(05 Marks)**

Module-2

3 a. Solve $(2x+1)^2y''-6(2x+1)y'+16y=8(2x+1)^2$. **(06 Marks)**

b. Solve $x^2p^4+2xp-y=0$ by solving for y. **(05 Marks)**

c. Solve $y=2px+y^2p^3$. **(05 Marks)**

OR

4 a. Solve $x^2y''+xy'+9y=3x^2\sin[3\log x]$. **(06 Marks)**

b. Solve $xy\left(\frac{dy}{dx}\right)^2-(x^2+y^2)\frac{dy}{dx}+xy=0$. **(05 Marks)**

c. Solve $xp^2-py+kp+a=0$ by reducing into Clairaut's form. Hence find singular solution. **(05 Marks)**

Module-3

5 a. Form the partial differential equation by eliminating the arbitrary function, $z=\phi(x+ay)+\psi(x-ay)$. **(05 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x\partial y}=\sin x\cos y$, given that $\frac{\partial z}{\partial y}=-2\cos y$ when $x=0$ and $z=0$ when $y=n\pi$. **(05 Marks)**

c. Derive one dimensional wave equation $\frac{\partial^2 u}{\partial t^2}=C^2\frac{\partial^2 u}{\partial x^2}$. **(06 Marks)**

OR

6 a. Obtain the partial differential equation, $\phi(x+y+z, x^2+y^2+z^2)=0$. **(05 Marks)**

b. Solve $\dfrac{\partial^2 z}{\partial y^2}=z$ given that $z=0$ and $\dfrac{\partial z}{\partial y}=\sin x$ when $y=0$. **(05 Marks)**

c. Find the solution of neat equation, $\dfrac{\partial u}{\partial t}=C^2\dfrac{\partial^2 u}{\partial x^2}$ by the method of separation of variables. **(06 Marks)**

Module-4

7 a. Evaluate $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}(x^2+y^2+z^2)dz\,dy\,dx$. **(05 Marks)**

b. Evaluate $\int_0^1\int_x^{\sqrt{x}} xy\,dydx$ by changing the order of integration. **(05 Marks)**

c. Evaluate $\int_0^2 \dfrac{x^2}{\sqrt{2-x}}dx$ by using Beta and Gamma functions. **(06 Marks)**

OR

8 a. Evaluate $\iint_R xy(x+y)dydx$ taken over the region between $y=x^2$ and $y=x$. **(05 Marks)**

b. Find the area of the circle $x^2+y^2=a^2$ by double integration. **(05 Marks)**

c. Show that $\int_0^{\frac{\pi}{2}}\dfrac{d\theta}{\sqrt{\sin\theta}}\times\int_0^{\frac{\pi}{2}}\sqrt{\sin\theta}\,d\theta=\pi$ **(06 Marks)**

Module-5

9 a. Find $L[te^{-2t}\sin 4t]$. **(05 Marks)**

b. Given that $f(t)=\begin{cases}a, & 0\le t\le a\\ -a, & a<t\le 2a\end{cases}$, where $f(t+2a)=f(t)$. Show that $L\{f(t)\}=\dfrac{a}{5}\tanh\left(\dfrac{as}{2}\right)$. **(05 Marks)**

c. Solve $y''+4y'+4y=e^t$, given that $y(0)=y'(0)=0$ by using Laplace transform method. **(06 Marks)**

OR

10 a. Find $L^{-1}\left[\dfrac{s+1}{s^2+6s+9}\right]$ **(05 Marks)**

b. Find $L^{-1}\left[\dfrac{1}{s(s^2+a^2)}\right]$ by using convolution theorem. **(05 Marks)**

c. Express $f(t)=\begin{cases}\cos t, & 0<t\le\pi\\ 1, & \pi<t\le 2\pi\\ \sin t & t>2\pi\end{cases}$ in term of unit step function and hence find its Laplace transform. **(06 Marks)**

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