CBCS SCHEME

USN | | | | | | | | | | 17MAT21

Second Semester B.E. Degree Examination, Feb./Mar. 2022
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 100

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 : $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=2\cos x$ by inverse differential operator method. **(06 Marks)**

b. Solve : $(D-2)^2y=8(e^{2x})$ by inverse differential operator method. **(07 Marks)**

c. Solve : $\frac{d^2y}{dx^2}+y=\tan x$ by the method of variation of parameters. **(07 Marks)**

OR

2 a. Solve : $(D^2-2D+5)y=e^{2x}$ by inverse differential operator method. **(06 Marks)**

b. Solve : $y''+16y=\sin 3x$ by inverse differential operator method. **(07 Marks)**

c. Solve : $y''-5y'+6y=e^{3x}+x$ by the method of undertermined coefficients. **(07 Marks)**

Module-2

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

b. Solve : $p^2-7p+10=0$. **(07 Marks)**

c. Solve : $\sin p\ x\cos y=\cos p\ x\sin y+p$ as a Clairaut's equation. Also find the singular solution. **(07 Marks)**

OR

4 a. Solve : $x^3\frac{d^3y}{dx^3}+3x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+8y=65\cos(\log x)$ **(06 Marks)**

b. Solve : $x^2p^2+xyp-6y^2=0$ **(07 Marks)**

c. Solve : $p^2+2py\cot x-y^2=0$ **(07 Marks)**

Module-3

5 a. Form the partial differential equation by eliminating the arbitrary function from $z=f\left(\frac{xy}{z}\right)$. **(06 Marks)**

b. Solve: $\frac{\partial^2z}{\partial x^2}=xy$ subject to the conditions that $\frac{\partial z}{\partial x}=\log(1+y)$ when $x=1$ and $z=0$ when $x=0$. (Use direct integration method). **(07 Marks)**

c. Obtain the solution of one dimensional heat equation $\frac{\partial u}{\partial t}=c^2\frac{\partial^2u}{\partial x^2}$ by the method of separation of variables for the positive constant. **(07 Marks)**

OR

6 a. Form the partial differential equation by eliminating arbitrary function from $\phi(x+y+z,\ x^2+y^2-z^2)=0$ **(06 Marks)**

b. Derive one dimensional wave equation in the form $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$. **(07 Marks)**

c. Solve : $\frac{\partial^2 z}{\partial x^2} + z = 0$ given that when $x = 0$, $z = e^y$ and $\frac{\partial z}{\partial x} = 1$. **(07 Marks)**

Module-4

7 a. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}\, dx\,dy\,dz$ **(06 Marks)**

b. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\,dx\,dy$ by changing the order of integration. **(07 Marks)**

c. Derive the relation between beta and gamma function as $\beta(m,n) = \frac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

OR

8 a. Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} (x^2+y^2+z^2)\,dz\,dy\,dx$ **(06 Marks)**

b. Find the area bounded between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ using double integration. **(07 Marks)**

c. Evaluate $\int_0^1 x^{3/2}(1-x)^{1/2}\,dx$ using beta and gamma functions. **(07 Marks)**

Module-5

9 a. Find the Laplace transform of

$2^t + \frac{\cos 2t - \cos 3t}{t}$ **(06 Marks)**

b. Given $f(t) = \begin{cases} E, & 0 < t < a/2 \\ -E, & a/2 < t < a \end{cases}$ where $f(t + a) = f(t)$, show that $L\{f(t)\} = \frac{E}{S}\tanh\left(\frac{as}{4}\right)$. **(07 Marks)**

c. Find the Inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$ using convolution theorem. **(07 Marks)**

OR

10 a. Find $L^{-1}\left\{\frac{3s+7}{s^2-2s-3}\right\}$ **(06 Marks)**

b. Express the function $f(t) = \begin{cases} \cos t, & 0 < t \le \pi \\ 1, & \pi < t \le 2\pi \\ \sin t, & t > 2\pi \end{cases}$ into unit step function hence find its Laplace transform. **(07 Marks)**

c. Solve: $y'' - 2y' + y = e^t$ given $y(0) = y'(0) = 0$ using Laplace transform. **(07 Marks)**

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