CBCS SCHEME

USN

15MAT21

Second Semester B.E. Degree Examination, June/July 2024
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Solve $y''+4y'+4y=3\sin x+4\cos x$ using inverse differential operator method. **(06 Marks)**

b. Solve $(D^2-4)y=(1+e^x)^2$ using inverse differential operator method. **(05 Marks)**

c. Solve $y''-2y'+y=e^x\log x$ by method of variation of parameters. **(05 Marks)**

OR

2 a. Solve $(D^2+2D+1)y=2x+x^2$ using inverse differential operator method. **(06 Marks)**

b. Solve $(D^2-4D+4)y=8x^2e^{2x}\sin 2x$ using inverse differential operator method. **(05 Marks)**

c. Solve $(D^2+2D+4)y=2x^2+3e^{-x}$ using method of undetermined coefficients. **(05 Marks)**

Module-2

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

b. Solve : $p^2+p(x+y)+xy=0$. **(05 Marks)**

c. Solve : $p=\sin(y-xp)$. Also find its singular solution. **(05 Marks)**

OR

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

b. Solve $xp^2-2yp+x=0$. **(05 Marks)**

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

Module-3

5 a. Form the partial differential equation by eliminating arbitrary function form the relation $f(x+y+z,\ x^2+y^2+z^2)=0$. **(06 Marks)**

b. Solve $\dfrac{\partial^2 z}{\partial x^2}+z=0$, given that when $x=0$, $z=e^y$ and $\dfrac{\partial z}{\partial x}=1$. **(05 Marks)**

c. Obtain all possible solutions of one dimensional wave equation $\dfrac{\partial^2 u}{\partial t}=c^2\dfrac{\partial^2 u}{\partial x^2}$ using separation of variables method. **(05 Marks)**

OR

6 a. Form the partial differential equation by eliminating the arbitrary constants from the relation $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}+\dfrac{z^2}{c^2}=1$. **(06 Marks)**

b. Solve $\dfrac{\partial^3 z}{\partial x^2\partial y}+18xy^2+\sin(2x-y)=0$. **(05 Marks)**

c. Derive one dimensional heat equation $\dfrac{\partial u}{\partial t}=c^2\dfrac{\partial^2 u}{\partial x^2}$ with usual notations. **(05 Marks)**

Module-4

7 a. Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} \frac{dx\,dy\,dx}{(1+x+y+z)^3}$. **(06 Marks)**

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

c. Obtain the relation between Beta and Gamma function in the form $\beta(m,n) = \frac{\Gamma m \, \Gamma n}{\Gamma m+n}$ **(05 Marks)**

OR

8 a. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dxdy$ by changing into polar co-ordinates. **(06 Marks)**

b. If A is the area of rectangular region bounded by the lines x = 0, x = 1, y = 0, y = 2 then evaluate $\int_A (x^2+y^2)dA$. **(05 Marks)**

c. Evaluate $\int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} \int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta$ using Beta and Gamma functions. **(05 Marks)**

Module-5

9 a. Find :

i) $L\{te^{-2t}\sin^2 t\}$

ii) $L\left\{\frac{e^{-at}e^{-bt}}{t}\right\}$. **(06 Marks)**

b. Given : $f(t) = t^2$, $0 < t < 2a$ and $f(t+2a) = f(t)$, find $L\{f(t)\}$. **(05 Marks)**

c. Using Laplace transforms solve the differential equation :

$y'' - 2y' + y = e^{2t}$ with $y(0) = 0$ and $y'(0) = 1$. **(05 Marks)**

OR

10 a. Find : $L^{-1}\left\{\frac{2s-1}{s^2+2s+17}\right\}$. **(06 Marks)**

b. Using convolution theorem find $L^{+1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$. **(05 Marks)**

c. Express $f(t) = \begin{cases} \cos t & 0 < t \le \pi \\ \cos 2t & \pi < t \le 2\pi \\ \cos 3t & t > 2\pi \end{cases}$

interms of unit step function and hence find its Laplace transforms. **(05 Marks)**

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