CBCS SCHEME

USN

17MAT21

Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$ (06 Marks)

b. Solve $(D^2 - 4)y = \text{Cosh}(2x - 1) + 3^x$ (07 Marks)

c. Solve $(D^2 + 1)y = \text{Sec}x$ by the method of variation of parameters. (07 Marks)

OR

2 a. Solve $D^3 - 9D^2 + 23D - 15)y = 0$ (06 Marks)

b. Solve $y'' - 4y' + 4y = 8(\text{Sin}2x + x^2)$ (07 Marks)

c. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2$ by the method of undetermined coefficients. (07 Marks)

Module-2

3 a. Solve $(x^2D^2 + xD + 1)y = \sin(2\log x)$ (06 Marks)

b. Solve $x^2p^2 + 3xyp + 2y^2 = 0$ (07 Marks)

c. Find the general and singular solution of Clairaut's equation $y = xp + p^2$. (07 Marks)

OR

4 a. Solve $(2x + 1)^2 y'' - 2(2x + 1)y' - 12y = 6x$ (06 Marks)

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

c. Find the general solution of $(p - 1)e^{3x} + p^3 e^{2y} = 0$ by using the substitution $X = e^x$, $Y = e^y$. (07 Marks)

Module-3

5 a. Form the partial differential equation by eliminating the function from $Z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$. (06 Marks)

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2\sin y$ when x = 0 and z = 0 when y is an odd multiple of $\frac{\pi}{2}$. (07 Marks)

c. Derive one dimensional wave equation $\frac{\partial^2 U}{\partial t^2} = C^2 \frac{\partial^2 U}{\partial x^2}$. (07 Marks)

OR

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

b. Solve $\frac{\partial^2 z}{\partial y^2}+z=0$ given that $z=\cos x$ and $\frac{\partial z}{\partial y}=\sin x$ when $y=0$. **(07 Marks)**

c. Obtain the variable separable solution of one dimensional heat equation $\frac{\partial U}{\partial t}=C^2\frac{\partial^2 U}{\partial x^2}$. **(07 Marks)**

Module-4

7 a. Evaluate $\int_0^2\int_1^2 (x^2+y^2)\,dx\,dy$ **(06 Marks)**

b. Evaluate $\int_0^\infty\int_x^\infty \frac{e^{-y}}{y}\,dy\,dx$ by changing the order of integration. **(07 Marks)**

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

OR

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

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

c. Prove that $\int_0^{\pi/2}\sqrt{\sin\theta}\,d\theta \int_0^{\pi/2}\frac{d\theta}{\sqrt{\sin\theta}}=\pi$ **(07 Marks)**

Module-5

9 a. Find the Laplace transform of $\left[\frac{\cos at-\cos bt}{t}\right]$. **(06 Marks)**

b. Express the function $f(t)=\begin{cases}\sin t & 0<t\le\frac{\pi}{2}\\ \cos t & t>\frac{\pi}{2}\end{cases}$ in terms of unit step function and hence find Laplace transform. **(07 Marks)**

c. Find $L^{-1}\left(\frac{s+2}{s^2-2s+5}\right)$. **(07 Marks)**

OR

10 a. Find the Laplace transform of the periodic function $f(t)=t^2$, $0<t<2$. **(06 Marks)**

b. Using convolution theorem obtain the Inverse Laplace transform of $\frac{1}{s^3(s^2+1)}$. **(07 Marks)**

c. Solve by using Laplace transform $y''+4y'+4y=e^{-t}$. Given that $y(0)=0$, $y'(0)=0$. **(07 Marks)**

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