USN

17MAT21

Second Semester B.E. Degree Examination, June/July 2019

Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Solve $(D^2+1)y = 3x^2+6x+12$. (06 Marks)

b. Solve $(D^3+2D^2+D)y = e^{-x}$. (07 Marks)

c. By the method of undetermined coefficients, solve $(D^2+D-2)y = x+\sin x$. (07 Marks)

OR

2 a. Solve $(D^2-6D+9)y = 6e^{3x}+7e^{-2x}$. (06 Marks)

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

c. By the method of variation of parameters, solve $(D^2+1)y = \operatorname{cosec} x$. (07 Marks)

Module-2

3 a. Solve $x^2y''-3xy'+4y = 1+x^2$. (06 Marks)

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

c. Solve $(px-y)(py+x) = a^2p$ by taking $x^2 = x$ and $y^2 = y$. (07 Marks)

OR

4 a. Solve $(2+x)^2y''+(2+x)y'+y = \sin(2\log(2+x))$. (06 Marks)

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

c. Obtain the general and singular solution of the equation $\sin px\cos y = \cos px\sin y+p$. (07 Marks)

Module-3

5 a. Form a partial differential equation by eliminating arbitrary function
$lx+my+nz = \phi(x^2+y^2+z^2)$ (06 Marks)

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

c. Derive an expression for the one dimensional wave equation. (07 Marks)

OR

6 a. Form a partial differential equation $z = f(y+2x)+g(y-3x)$. (06 Marks)

b. Solve $\frac{\partial^2 z}{\partial y^2} = z$, given that when y = 0, $z = e^x$ and $\frac{\partial z}{\partial y} = e^{-x}$. (07 Marks)

c. Find all possible solutions of heat equation $u_t = c^2u_{xx}$ by the method of separation of variables. (07 Marks)

Module-4

7 a. Evaluate $\iint r\sin\theta \, dr \, d\theta$ over the cardioids $r = a(1-\cos\theta)$ above the initial line. **(06 Marks)**

b. Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x \, dz \, dx \, dy$. **(07 Marks)**

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

OR

8 a. Evaluate by changing the order of integration $\int_0^\infty \int_x^\infty \dfrac{e^{-y}}{y} \, dy dx$. **(06 Marks)**

b. Find by double integration, the area lying between the parabola $y = 4x - x^2$ and the line $y = x$. **(07 Marks)**

c. Show that $\int_0^{\pi/2} \sqrt{\cot\theta} \, d\theta = \dfrac{1}{2} \left|\!\left(\dfrac{1}{4}\right) \left|\!\left(\dfrac{3}{4}\right)\right.\right.$ **(07 Marks)**

Module-5

9 a. Find the Laplace transform of $\left(t\cos 2t + \dfrac{1-e^{3t}}{t}\right)$. **(06 Marks)**

b. Find the Laplace transform of $f(t) = E\sin\omega t$, $0 < t < \dfrac{\pi}{\omega}$ having the period $\dfrac{\pi}{\omega}$. **(07 Marks)**

c. Solve $y'' - 3y' + 2y = 2e^{3t}$, $y(0) = y'(0) = 0$ by using Laplace transforms. **(07 Marks)**

OR

10 a. Find the inverse Laplace transforms of $\dfrac{s+1}{s^2+2s+2} + \log\left(\dfrac{s+a}{s+b}\right)$. **(06 Marks)**

b. By using convolution theorem, find $L^{-1}\left[\dfrac{s}{(s^2+1)(s-1)}\right]$. **(07 Marks)**

c. Express $f(t) = \begin{cases} \sin t, & 0 < t \le \pi/2 \\ \cos t, & \pi/2 < t \le \pi \\ 1, & \pi < t \end{cases}$ in terms of unit step functions and hence find its Laplace transform. **(07 Marks)**

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