CBCS Scheme

USN | | | | | | | | | | |

17MAT21

Second Semester B.E. Degree Examination, June/July 2018
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 $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 6e^{3x}$. **(06 Marks)**

b. Solve $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} - 4\frac{dy}{dx} - 4y = 3e^x$. **(07 Marks)**

c. Solve by the method of variation of parameter $y'' + y = \frac{1}{1+\sin x}$. **(07 Marks)**

OR

2 a. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 25y = e^{2x} + \sin x + x$. **(06 Marks)**

b. Solve $y'' + 4y' + 5y = -2\cosh x$; find y when $y = 0$ and $\frac{dy}{dx} = 1$ at $x = 0$. **(07 Marks)**

c. Solve by the method of undetermined coefficient $(D^2 - 3D + 2)y = x^2 + e^x$. **(07 Marks)**

Module-2

3 a. Solve $x\frac{d^2y}{dx^2} - \frac{2y}{x} = x + \frac{1}{x^2}$ **(06 Marks)**

b. Solve $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$ **(07 Marks)**

c. Find the general and singular solution for $xp^2 + xp - yp + 1 - y = 0$. **(07 Marks)**

OR

4 a. Solve $(2x+3)^2 y'' - (2x+3)y' - 12y = 6x$. **(06 Marks)**

b. Solve $xy\left\{\left(\frac{dy}{dx}\right)^2 + 1\right\} = (x^2 + y^2)\frac{dy}{dx}$. **(07 Marks)**

c. Find the general solution by reducing to Clairaut's form $(px - y)(x + py) = 2p$ using $U = x^2$ and $V = y^2$. **(07 Marks)**

Module-3

5 a. Find the partial differential equation of all spheres $(x-a)^2 + (y-b)^2 + z^2 = c^2$. **(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 with usual notations. **(07 Marks)**

OR

6 a. Form the partial differential equation by eliminating the arbitrary function from $z = y\phi(x) + x\psi(y)$. **(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 the various possible solution for one dimensional heat equation by the method of separation of variables. **(07 Marks)**

Module-4

7 a. Prove that $\Gamma(\frac{1}{2}) = \sqrt{\pi}$. **(06 Marks)**

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

c. Evaluate $\iint xy(x+y)dxdy$ over the area between $y = x^2$ and $y = x$. **(07 Marks)**

OR

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

b. Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$. **(07 Marks)**

c. Prove that with usual notations $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

Module-5

9 a. Find the Laplace transform of $\frac{\cos 2t - \cos 3t}{t}$. **(06 Marks)**

b. Express the function in terms of unit step function and hence find its Laplace transform

$$f(t) = \begin{cases} \cos t & 0 < t < \pi \\ 1 & \pi < t < 2\pi \\ \sin t & t > 2\pi \end{cases}$$ **(07 Marks)**

c. Find $L^{-1}\left\{\frac{s+3}{s^2 - 4s + 13} + \log_e\left(\frac{s+1}{s-1}\right)\right\}$. **(07 Marks)**

OR

10 a. Find the Laplace transform of the periodic function

$$f(t) = \begin{cases} t & 0 < t < \pi \\ \pi - t & \pi < t < 2\pi \end{cases}$$ of period 2π. **(06 Marks)**

b. Using convolution theorem obtain the inverse Laplace transform of $\frac{s}{(s+2)(s^2+9)}$. **(07 Marks)**

c. Solve the equation $y'' - 3y' + 2y = e^{3t}$; y(0) = 1 and y'(0) = 0 using Laplace transform technique. **(07 Marks)**

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