CBCS SCHEME

USN

15MAT21

Second Semester B.E. Degree Examination, June/July 2018
Engineering Mathematics – II

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Solve : $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - y = 0$ **(05 Marks)**

b. Solve : $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = (1-e^x)^2$ **(05 Marks)**

c. Solve $\frac{d^2y}{dx^2} + y = \sec x . \tan x$ by the method of variation of parameters. **(06 Marks)**

OR

2 a. Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = x^2$, using inverse differential operator method. **(05 Marks)**

b. Solve $\frac{d^2y}{dx^2} - 4y = x.\sin 2x$, using inverse differential operator method. **(05 Marks)**

c. Solve by the method of undetermined coefficients

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{3x} + \sin x$$ **(06 Marks)**

Module-2

3 a. Solve : $x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = \frac{1}{(1-x)^2}$ **(05 Marks)**

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

c. Solve : $x - yp = ap^2$ by solving for x **(06 Marks)**

OR

4 a. Solve : $(3x+2)^2\frac{d^2y}{dx^2} + 5(3x+2)\frac{dy}{dx} - 3y = x^2 + x + 1$ **(06 Marks)**

b. Solve : $p^2 + 2py\cot x - y^2$ by solving for p. **(05 Marks)**

c. Solve the equation $(px - y)(x - py) = 2p$ by reducing it into Clairaut's form by taking a substitution $x^2 = u$ and $y^2 = v$. **(05 Marks)**

Module-3

5 a. Form a partial differential equation by eliminating arbitrary constants

$(x-a)^2 + (y-b)^2 = z^2\cot^2\alpha$, where 'α' is the parameter. **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \cdot \sin y$ for which $\frac{\partial z}{\partial y} = -2\sin y$, when $x = 0$ and $z = 0$ when y is an odd multiple of $\pi/2$. **(05 Marks)**

c. Derive the one-dimensional wave equation in the form $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$. **(05 Marks)**

OR

6 a. Form a partial differential equation by eliminating the arbitrary function from $z = f(x + at) + g(x - at)$ **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$ subject to the conditions that $z = 1$ and $\frac{\partial z}{\partial x} = y$ when $x = 0$. **(06 Marks)**

c. Derive the one dimensional heat equation in the form $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$. **(04 Marks)**

Module-4

7 a. Evaluate $\int_1^2 \int_3^4 (xy + e^y)\,dy\,dx$ **(05 Marks)**

b. Evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y}\,dx\,dy$ by changing the order of integration. **(05 Marks)**

c. Obtain the relation between beta and gamma function in the form $\beta(m,n) = \frac{\Gamma m \cdot \Gamma n}{\Gamma(m+n)}$ **(06 Marks**

OR

8 a. Evaluate $\int_0^{2a} \int_0^{\sqrt{2ax - x^2}} x^2\,dy\,dx$ by changing to polar coordinate. **(05 Marks**

b. Evaluate $\int_{-1}^{1} \int_0^{z} \int_{x-z}^{x+y} (x + y + z)\,dy\,dx\,dz$ **(05 Marks**

c. Evaluate $\int_0^{\pi/2} \sqrt{\tan\theta} \cdot d\theta$ **(06 Marks**

Module-5

9 a. Evaluate (i) $L\{t^3 + 4t^2 - 3t + 5\}$ (ii) $L\{\cos t \cdot \cos 2t \cdot \cos 3t\}$ **(06 Marks)**

b. Find the Laplace transform of $L\{e^{3t} \cdot \sin 5t \cdot \sin 3t\}$ **(05 Marks)**

c. Solve the equation $\frac{d^2 y}{dt^2} + 3\frac{dy}{dt} + 2y = 0$ under the conditions $y(0) = 1$, $y'(0) = 0$. **(05 Marks)**

OR

10 a. Evaluate : $L^{-1}\left\{\frac{4s + 5}{(s+1)^2(s+2)}\right\}$ **(06 Marks)**

b. Find $L^{-1}\left\{\frac{1}{(s+1)(s^2+1)}\right\}$ by using convolution theorem. **(05 Marks)**

c. Express the function in terms of unit step function and hence find their Laplace transform

$$f(t) = \begin{cases} 1, & 0 \le t \le 1 \\ t, & 0 < t \le 2 \\ t^2, & t > 2 \end{cases}$$ **(05 Marks)**

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