CBCS SCHEME

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15MAT21

Second Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 $\frac{d^2y}{dx^2} - 4y = \cosh(2x-1) + 3^x$ by inverse differential operator method. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 3y = e^x \cos x$ by inverse differential operator method. **(05 Marks)**

c. Solve $(D^2 + 1)y = \operatorname{cosec} x$ by the method of variation of parameters. **(05 Marks)**

OR

2 a. Solve $(D^3 - 5D^2 + 8D - 4)y = (e^x + 1)^2$ by inverse differential operator method. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} - y = (1 + x^2)e^x$ by inverse differential operator method. **(05 Marks)**

c. Solve $(D^2 - 3D + 2)y = x^2 + e^{3x}$ by the 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 $(1 + 2x)^2 y'' - 6(1 + 2x)y' + 16y = 8(1 + 2x)^2$ **(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 from $z = f(x + ay) + g(x - ay)$ by eliminating arbitrary functions f and g. **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \cos y$, given $\frac{\partial z}{\partial y} = -2\cos y$ when $x = 0$ and when y is odd multiple of π $z = 0$. **(05 Marks)**

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

OR

6 a. Obtain the partial differential equation by eliminating a, b, c from $z = ax^2 + bxy + cy^2$. **(06 Marks)**

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

c. Obtain the various possible solutions of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ by the method of variables separable. **(05 Marks)**

Module-4

7 a. Evaluate $\int_1^3 \int_{1/x}^1 \int_0^{\sqrt{xy}} xyz\,dz\,dy\,dx$ **(06 Marks)**

b. Change the order of integration in $\int_0^a \int_y^a \frac{x\,dx\,dy}{x^2 + y^2}$ and hence evaluate. **(05 Marks)**

c. Prove that $\int_0^{\pi/2} \sqrt{\sin\theta}\,d\theta \times \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} = \pi$ **(05 Marks)**

OR

8 a. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} y^2\sqrt{x^2+y^2}\,dydx$ by changing into polar coordinates. **(06 Marks)**

b. Find by double integration the area bounded between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$. **(05 Marks)**

c. Prove that $\beta(m,n) = \frac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}$ **(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 $f(t) = \begin{cases} \cos t & : \quad 0 < t \le \pi \\ \cos 2t & : \quad \pi < t \le 2\pi \\ \cos 3t & : \quad t > 2\pi \end{cases}$

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

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