CBCS SCHEME

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17MAT21

Second Semester B.E. Degree Examination, Dec.2018/Jan.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 $y''' - y'' + 4y' - 4y = \sin h(2x+3)$. **(06 Marks)**

b. Solve $y'' + 2y' + y = 2x + x^2$. **(07 Marks)**

c. Solve $(D^2+1)y = \tan x$ by method of variation of parameter. **(07 Marks)**

OR

2 a. Solve $(D^3 - 1)y = 3\cos 2x$, where $D = \dfrac{d}{dx}$. **(06 Marks)**

b. Solve $y'' - 6y' + 9y = 7e^{-2x} - \log 2$. **(07 Marks)**

c. Solve $y'' - 3y' + 2y = x^2 + e^x$ by the method of un-determined coefficients. **(07 Marks)**

Module-2

3 a. Solve $x^2y'' + xy' + 9y = 3x^2 + \sin(3\log x)$. **(06 Marks)**

b. Solve $y\left(\dfrac{dy}{dx}\right)^2 + (x-y)\dfrac{dy}{dx} - x = 0$. **(07 Marks)**

c. Solve $(px - y)(py + x) = 2p$ by reducing it into Cliuraut's form by taking $X = x^2$ and $Y = y^2$. **(07 Marks)**

OR

4 a. Solve $(3x+2)^2 y'' + 3(3x+2)y' - 36y = 8x^2 + 4x + 1$. **(06 Marks)**

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

c. Show that the equation $xp^2 + px - py + 1 - y = 0$ is Clairaut's equation and find its general and singular solution. **(07 Marks)**

Module-3

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

b. Solve $\dfrac{\partial^2 u}{\partial x^2} = x + y$. **(07 Marks)**

c. Derive the one dimensional heat equation $u_t = c^2.u_{xx}$ **(07 Marks)**

OR

6 a. Form the partial differential equation of the equation $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z^2}{c^2} = 1$ by eliminating arbitrary constants. **(06 Marks)**

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

c. Obtain the solution of one dimensional wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables for the positive constant. **(07 Marks)**

Module-4

7 a. Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dy\,dx\,dz$. **(06 Marks)**

b. Evaluate $\int_{0}^{1}\int_{0}^{\sqrt{1-x^2}} y^2\,dy\,dx$ by changing the order of integration. **(07 Marks)**

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

OR

8 a. Evaluate $\int_{0}^{1}\int_{0}^{\sqrt{1-y^2}} x^3 \cdot y\,dx\,dy$ **(06 Marks)**

b. Evaluate $\int_{-a}^{a}\int_{0}^{\sqrt{a^2-x^2}} \sqrt{x^2+y^2}\,dy\,dx$ by changing into polar coordinates. **(07 Marks)**

c. Evaluate $\int_{0}^{\infty}\frac{dx}{1+x^4}$ by expressing in terms of beta function. **(07 Marks)**

Module-5

9 a. Find (i) $L[t\cos at]$ (ii) $L\left[\frac{\sin at}{t}\right]$. **(06 Marks)**

b. Find the Laplace transform of the full wave rectifier $f(t) = E\sin wt$, $0 < t < \frac{\pi}{w}$ with period $\frac{\pi}{w}$. **(07 Marks)**

c. Solve $y'' + k^2 y = 0$ given that $y(0) = 2$, $y'(0) = 0$ using Laplace transform. **(07 Marks)**

OR

10 a. Find Inverse Laplace transform of $\frac{s+2}{s^2(s+3)}$. **(06 Marks)**

b. Express the function

$$f(t) = \begin{cases} \cos t, & 0 < t < \pi \\ \sin t, & t > \pi \end{cases}$$

in terms of unit step function and hence find its Laplace transform. **(07 Marks)**

c. Find Inverse Laplace transform of $\frac{1}{s(s^2+a^2)}$ using convolution theorem. **(07 Marks)**

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