CBCS SCHEME

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15MAT21

Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 $\frac{dy^2}{dx^2} - 4y = \text{Cosh}(2x-1) + 3^x$ by inverse differential operators method. **(06 Marks)**

b. Solve $(D^3 - 1)y = 3\,\text{Cos}\,2x$ by inverse differential operators method. **(05 Marks)**

c. Solve $(D^2 + a^2)\,y = \text{Sec}\,(ax)$ by the method of variation of parameters. **(05 Marks)**

OR

2 a. Solve $(D^2 - 2D + 5)\,y = e^{2x}\,\text{Sin}\,x$ by inverse differential operator method. **(06 Marks)**

b. Solve $(D^3 + D^2 + 4D + 4)\,y = x^2 - 4x - 6$ by inverse differential operator method. **(05 Marks)**

c. Solve $y'' - 2y' + 3y = x^2 - \text{Cos}\,x$ by the method of undetermined coefficients. **(05 Marks)**

Module-2

3 a. Solve $x^3y''' + 3x^2y'' + xy' + 8y = 65\,\text{Cos}(\log x)$ **(06 Marks)**

b. Solve $xy\left(\frac{dy}{dx}\right)^2 - (x^2 + y^2)\frac{dy}{dx} + xy = 0$ **(05 Marks)**

c. Solve the equation $(px - y)\,(py + x) = 2p$ by reducing into Clairaut's form taking the substitution $X = x^2$, $Y = y^2$. **(05 Marks)**

OR

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

b. Solve $y = 2px + p^2y$ by solving for 'x'. **(05 Marks)**

c. Find the general and singular solution of equation $xp^2 - py + kp + a = 0$. **(05 Marks)**

Module-3

5 a. Obtain partial differential equation by eliminating arbitrary function.
Given $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$. **(06 Marks)**

b. Solve $\frac{\partial^2 u}{\partial x\,\partial t} = e^{-t}\text{Cos}\,x$, given that $u = 0$ when $t = 0$ and $\frac{\partial u}{\partial t} = 0$ at $x = 0$. **(05 Marks)**

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

OR

6 a. Obtain partial differential equation of
$f(x^2 + 2yz, y^2 + 2zx) = 0$. **(06 Marks)**

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

c. Find the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$. (05 Marks)

Module-4

7 a. Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} \frac{dx\,dy\,dx}{(1+x+y+z)^3}$. (06 Marks)

b. Evaluate integral $\int_0^1 \int_x^{\sqrt{x}} xy\,dy\,dx$ by changing the order of integration. (05 Marks)

c. Obtain the relation between Beta and Gamma function in the form $\beta(m,n) = \frac{\overline{|m}\,\overline{|n}}{\overline{|m+n}}$ (05 Marks)

OR

8 a. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dxdy$ by changing into polar co-ordinates. (06 Marks)

b. If A is the area of rectangular region bounded by the lines x = 0, x = 1, y = 0, y = 2 then evaluate $\int_A (x^2+y^2) dA$. (05 Marks)

c. Evaluate $\int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} \int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta$ using Beta and Gamma functions. (05 Marks)

Module-5

9 a. Find Laplace transition of i) $t^2 e^{2t}$ ii) $\frac{e^{-at} - e^{-bt}}{t}$. (06 Marks)

b. If a periodic function of period 2a is defined by $f(t) = \begin{cases} t & \text{if } 0 \le t \le a \\ 2a - t & \text{if } a \le t \le 2a \end{cases}$

Then show that $L\{f(t)\} = \frac{1}{s^2} \tan h\left(\frac{as}{2}\right)$. (05 Marks)

c. Solve $y''(t) + 4y'(t) + 4y(t) = e^t$ with $y(0) = 0$ $y'(0) = 0$. Using Laplace transform. (05 Marks)

OR

10 a. Find $L^{-1}\left[\frac{7s}{(4s^2+4s+9)}\right]$ (06 Marks)

b. Find $L^{-1}\left[\frac{s}{(s-1)(s^2+4)}\right]$ using convolution theorem. (05 Marks)

c. Express the following function interms of Heaviside unit step function and hence its Laplace transistor $f(t) = \begin{cases} t^2, & 0 < t \le 2 \\ 4t, & t > 2 \end{cases}$ (05 Marks)

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