CBCS SCHEME

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

15MAT21

Second Semester B.E. Degree Examination, Aug./Sept.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 $y''' + y'' + y' + y = e^{3x+4} + \sinh x$ by inverse differential operator method. **(06 Marks)**

b. Solve $y'' + 16y = x \sin 3x$ by inverse differential operator method. **(05 Marks)**

c. Solve $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$ by the method of variation of parameters. **(05 Marks)**

OR

2 a. Solve $y'' + 4y' + 4y = 3 \sin x + \cos 4x$ by inverse differential operator method. **(06 Marks)**

b. Solve $y'' + 2y = x^2 e^{3x} + e^x \cos 2x$ by inverse differential Operation method. **(05 Marks)**

c. Solve $y'' + y' - 2y = x + \sin x$ by the method of undetermined coefficients. **(05 Marks)**

Module-2

3 a. Solve $x^3 y''' + 2x^2 y'' + 2y = 10(x + \frac{1}{x})$. **(06 Marks)**

b. Solve $y = x(p + \sqrt{1+p^2})$ where $p = \frac{dy}{dx}$. **(05 Marks)**

c. Find the general and singular solution of the equation $y = xp + p^2$. **(05 Marks)**

OR

4 a. Solve $(2x+1)^2 y'' - 2(2x+1)\frac{dy}{dx} - 12y = 3(2x+1)$. **(06 Marks)**

b. Solve $y = 3px + 6p^2y^2$, solving for x. **(05 Marks)**

c. Find the general and singular solution of $y = px - \sqrt{1+p^2}$. **(05 Marks)**

Module-3

5 a. Obtain a partial differential equation by eliminating arbitrary constants in the equation $z = xy + y\sqrt{x^2 - a^2} + b$. **(06 Marks)**

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

c. Solve the one dimensional wave equation $c^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ by the method of separation of variables. **(05 Marks)**

OR

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

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

c. Solve the one dimensional heat equation $c^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$, by the method of separation of variables. **(05 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

7 a. Evaluate $\int_0^1 \int_0^2 \int_1^2 xyz^2 \, dx\, dy\, dz$. **(06 Marks)**

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

c. Prove that $\beta(m, n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}} dx, \ m > 0, \ n > 0$. **(05 Marks)**

OR

8 a. Evaluate $\int_0^{\pi/2} \int_0^{a\sin\theta} \int_1^{\left(\frac{a^2-r^2}{a}\right)} r\, dz\, dr\, d\theta$. **(06 Marks)**

b. Change the order of integration and evaluate $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dy\, dx$. **(05 Marks)**

c. Prove that $\Gamma(n) = 2\int_0^\infty e^{-t^2} t^{2n-1} dt$. **(05 Marks)**

Module-5

9 a. Find the Laplace transform of

i) t sint ii) $\left(\frac{\cos 6t - \cos 4t}{t}\right)$. **(06 Marks)**

b. Find $L[f(t)]$, if $f(t) = \begin{cases} t, & 0 < t \le a \\ (2a - t), & a < t \le 2a \end{cases}$, where $f(t + 2a) = f(t)$. **(05 Marks)**

c. Express $f(t) = \begin{cases} 1, & 0 < t \le 1 \\ t, & 1 < t \le 2 \\ t^2, & t > 2 \end{cases}$

in terms of unit step function and find its Laplace transform. **(05 Marks)**

OR

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

b. Using Convolution theorem find $L^{-1}\left[\frac{s}{(s^2+1)(s^2+4)}\right]$. **(05 Marks)**

c. Solve $y'' + 4y' + 3y = e^{-t}$ using Laplace transform, given that $y(0) = 1$, $y'(0) = 1$. **(05 Marks)**

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