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Second Semester B.E. Degree Examination, Dec.2019/Jan.2020 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 $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$ (06 Marks)
- b. Solve $(D^2 - 4)y = \text{Cosh}(2x - 1) + 3^x$ (07 Marks)
- c. Solve $(D^2 + 1)y = \text{Sec}x$ by the method of variation of parameters. (07 Marks)

OR

- 2 a. Solve $D^3 - 9D^2 + 23D - 15)y = 0$ (06 Marks)
- b. Solve $y'' - 4y' + 4y = 8(\sin 2x + x^2)$ (07 Marks)
- c. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2$ by the method of undetermined coefficients. (07 Marks)

Module-2

- 3 a. Solve $(x^2D^2 + xD + 1)y = \sin(2\log x)$ (06 Marks)
- b. Solve $x^2p^2 + 3xyp + 2y^2 = 0$ (07 Marks)
- c. Find the general and singular solution of Clairaut's equation $y = xp + p^2$. (07 Marks)

OR

- 4 a. Solve $(2x + 1)^2 y'' - 2(2x + 1)y' - 12y = 6x$ (06 Marks)
- b. Solve $p^2 + 2py \cot x - y^2 = 0$ (07 Marks)
- c. Find the general solution of $(p - 1)e^{3x} + p^3 e^{2y} = 0$ by using the substitution $X = e^x, Y = e^y$. (07 Marks)

Module-3

- 5 a. Form the partial differential equation by eliminating the function from $Z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$. (06 Marks)
- b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2 \sin y$ when $x = 0$ and $z = 0$ when y is an odd multiple of $\frac{\pi}{2}$. (07 Marks)
- c. Derive one dimensional wave equation $\frac{\partial^2 U}{\partial t^2} = C^2 \frac{\partial^2 U}{\partial x^2}$. (07 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.



OR

- 6 a. Form the partial differential equation by eliminating the function from $f(x + y + z, x^2 + y^2 + z^2) = 0$ (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 $y = 0$. (07 Marks)
- c. Obtain the variable separable solution of one dimensional heat equation $\frac{\partial U}{\partial t} = C^2 \frac{\partial^2 U}{\partial x^2}$. (07 Marks)

Module-4

- 7 a. Evaluate $\int_0^2 \int_1^2 (x^2 + y^2) dx dy$ (06 Marks)
- b. Evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy dx$ by changing the order of integration. (07 Marks)
- c. Derive the relation between Beta and Gamma function as $B(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (07 Marks)

OR

- 8 a. Evaluate $\int_{-c-b-a}^c \int_b^a \int_a^b (x^2 + y^2 + z^2) dx dy dz$ (06 Marks)
- b. Find the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$. (07 Marks)
- c. Prove that $\int_0^{\pi/2} \sqrt{\sin \theta} d\theta = \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin \theta}} = \pi$ (07 Marks)

Module-5

- 9 a. Find the Laplace transform of $\left[\frac{\cos at - \cos bt}{t} \right]$. (06 Marks)
- b. Express the function $f(t) = \begin{cases} \sin t & 0 < t \leq \frac{\pi}{2} \\ \cos t & t > \frac{\pi}{2} \end{cases}$ in terms of unit step function and hence find Laplace transform. (07 Marks)
- c. Find $L^{-1} \left(\frac{s+2}{s^2-2s+5} \right)$. (07 Marks)

OR

- 10 a. Find the Laplace transform of the periodic function $f(t) = t^2, 0 < t < 2$. (06 Marks)
- b. Using convolution theorem obtain the Inverse Laplace transform of $\frac{1}{s^3(s^2+1)}$. (07 Marks)
- c. Solve by using Laplace transform $y'' + 4y' + 4y = e^{-t}$. Given that $y(0) = 0, y'(0) = 0$. (07 Marks)
