



US

15MAT21

Second Semester B.E. Degree Examination, June/July 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 $(D^2 - 4D + 4)y = e^{2x} + \cos 2x + 4$ by inverse differential operator method. (06 Marks)
- b. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + Sy e^{2x} \sin x$ by inverse differential operator method. (05 Marks)
- c. Using the method of undetermined coefficients, solve $y'' - 3y' + 2y = e^x$. (05 Marks)

OR

- 2 a. Solve $\frac{dy}{dx} + y = x e^x \sin x$ by inverse differential operator method. (06 Marks)
- b. Solve $(D^3 - 6D^2 + 11D - 6)y = e^{-2x}$ by inverse differential operator method. (05 Marks)
- c. Solve $y'' - 2y' + y = x$ by method of variation of parameters. (05 Marks)

Module-2

- 3 a. Solve $(2x-1)2\frac{dy}{dx} + (2x-1)\frac{dy}{dx} - 2y = 8x' - 2x + 3$. (06 Marks)
- b. Solve $xy(\frac{dy}{dx} + y')\frac{dy}{dx} + xy = 0$ (05 Marks)
- c. Solve $x^2(y - px) - p^2y$ by reducing into Clairaut's form and using the substitution $X = x^2$ and $Y =$ (05 Marks)

OR

- 4 a. Solve $x^{-1}y'' - xy' + 2y = x \sin(\log x)$. (06 Marks)
- b. Obtain the general solution of the differential equation $p^2 + 4x'p - 12x^4y = 0$. (05 Marks)
- c. Obtain the general and singular solution of $y = 2px + p^2y$. (05 Marks)

Module-3

- 5 a. Form the partial differential equation by eliminating the arbitrary function from the relation $Z = y f(x) + x g(y)$. (06 Marks)
- b. Solve $\frac{z}{ax^2} = x \sin y$ for which $\frac{z}{0} = -2 \sin y$ when $x = 0$ and $z = 0$ when y is an odd multiple of $n/2$. (05 Marks)
- c. Derive one dimensional wave equation $\frac{\partial^2 z}{\partial t^2} = \frac{\partial^2 z}{\partial x^2}$ (05 Marks)

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OR

- 6 a. Form a partial differential by eliminating the arbitrary function (I) from the relation $(x^2 + y^2 + z^2, z^2 - 2xy) = 0$. (06 Marks)
- b. Solve $\frac{a^2 z}{ax^2} + 4z = 0$, given that when $x = 0$, $z = e^m$ and $\frac{az}{ax} = 2$. (05 Marks)
- c. Determine the solution of the heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables for the constant K is positive. (05 Marks)

Module-4

- 7 a. Evaluate $\int_1^4 (xy + e^x) dy dx$ (06 Marks)
- b. Evaluate $\int_0^{x^2/4a} dy dx$ by changing the order of integration. (05 Marks)
- c. Obtain the relation between the beta and gamma function in the form
$$B(m, n) = \frac{\Gamma(m) \Gamma(n)}{\Gamma(m+n)}$$
 (05 Marks)

OR

- 8 a. Evaluate $\int_0^x \int_0^y x^2 dy dx$ by changing into polar coordinates. (06 Marks)
- b. Evaluate $\int_0^x \int_0^y \int_0^z y^2 dz dy dx$ (05 Marks)
- c. Using beta and gamma function, prove that $\int_0^1 \frac{x^2}{-x^4} dx = \frac{\pi}{4} \frac{1}{1+x^4}$ (05 Marks)

Module-5

- 9 a. Find $L\left\{\frac{t}{t^2} + t \sin t\right\}$ (06 Marks)
- b. If $f(t) = \frac{t}{2m} - \frac{0}{t^2} \sin t$, where $g(t + 2n) = f(t)$, then prove that $L\{f(t)\} = \frac{1}{s} \tan^{-1} \frac{1}{s}$ (05 Marks)
- c. Find $r^i \left| \frac{s}{s^2 \pm a^2} \right|$ using convolution theorem. (05 Marks)

OR

- 10 a. Express $f(t) = \begin{cases} 0 & 0 < t < 1 \\ t & 1 < t < 2 \\ t^2 & t > 2 \end{cases}$ in term of unit step function and hence find its Laplace transform. (06 Marks)
- b. Find $L^{-1} \left\{ \frac{s+5}{s^2-6s+13} \right\}$ (05 Marks)
- c. Employ the Laplace transform to solve the differential equation $y''(t) + 4y'(t) + 4y(t) = e^t$ with the initial condition $y(0) = 0$ and $y'(0) = 0$. (05 Marks)