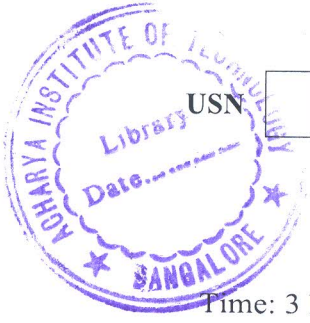


# CBCS SCHEME



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17MAT21

## Second Semester B.E. Degree Examination, Jan./Feb. 2021 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  $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = e^{3x}$  (06 Marks)
- b. Solve  $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 3\sin x$  (07 Marks)
- c. Solve by the method of undetermined coefficients  
 $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2 + 3e^{-x}$  (07 Marks)

OR

- 2 a. Solve  $(D^4 + 4D^3 - 5D^2 - 36D - 36)y = 0$  (06 Marks)
- b. Solve  $\frac{d^2y}{dx^2} + \frac{dy}{dx} = x^2 + 2x + 4$  (07 Marks)
- c. Solve by variation of parameters method  $\frac{d^2y}{dx^2} + a^2y = \tan ax$  (07 Marks)

### Module-2

- 3 a. Solve  $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = \log x$  (06 Marks)
- b. Solve  $xy \left( \frac{dy}{dx} \right)^2 - (x^2 + y^2) \frac{dy}{dx} + xy = 0$  (07 Marks)
- c. Find the general and singular solution of  $y = px - \sin^{-1} p$ . (07 Marks)

OR

- 4 a. Solve  $(1+x)^2 \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = \sin(2 \log(1+x))$  (06 Marks)
- b. Solve  $p^2 + 2py \cot x = y^2$ , where  $p = \frac{dy}{dx}$  (07 Marks)
- c. Solve  $(px - y)(py + x) = a^2 p$  by taking  $x^2 = X$  and  $y^2 = Y$ . (07 Marks)

### Module-3

- 5 a. Form the partial differential equation from  $xyz = \phi(x + y + z)$  (06 Marks)
- b. Solve  $\frac{\partial^3 z}{\partial x^2 \partial y} + 18xy^2 + \sin(2x - y) = 0$  by direct integration. (07 Marks)
- c. Find all possible solutions of the one-dimensional heat equation  $U_t = c^2 U_{xx}$  by the method of separation of variables. (07 Marks)

OR

- 6 a. Form the partial differential equation from  $z = f(x + at) + g(x - at)$ , where  $a$  is a constant. (06 Marks)
- b. Solve  $\frac{\partial^2 z}{\partial x^2} = a^2 z$ , given that at  $x = 0$ ,  $\frac{\partial z}{\partial x} = a \sin y$  and  $z = 0$ . (07 Marks)
- c. With suitable assumptions, derive the one dimensional wave equation as  $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$  (07 Marks)

**Module-4**

- 7 a. Evaluate  $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3 y dx dy$  by changing the order of integration. (06 Marks)
- b. Evaluate  $\int_{-1}^1 \int_0^{x+z} \int_0^{x-z} (x + y + z) dx dy dz$  (07 Marks)
- c. Show that  $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$  (07 Marks)

OR

- 8 a. Evaluate  $\int_0^a \int_y^a \frac{x}{x^2 + y^2} dx dy$  by changing to polar coordinates. (06 Marks)
- b. Using double integration find the area between the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$ . (07 Marks)
- c. Prove that  $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$  (07 Marks)

**Module-5**

- 9 a. Find Laplace transform of  $t(\sin at + \cos at)$  (06 Marks)
- b. Find the Laplace transform of the periodic function of period  $2a$  given by  

$$f(t) = \begin{cases} t, & 0 < t < a \\ 2a - t, & a < t < 2a \end{cases}$$
 (07 Marks)
- c. Using convolution theorem find  $L^{-1}\left[\frac{s}{(s^2 + a^2)^2}\right]$  (07 Marks)

OR

- 10 a. Express  $f(t) = \begin{cases} \cos t, & 0 < t < \pi \\ \cos 2t, & \pi < t < 2\pi \\ \cos 3t, & t > 2\pi \end{cases}$  in terms of unit-step function and hence find  $L(f(t))$ . (06 Marks)
- b. Find the inverse Laplace transform of  
 i)  $\frac{s^2 - 3s + 4}{s^3}$  and ii)  $\frac{s + 2}{s^2 - 4s + 13}$  (07 Marks)
- c. Solve by Laplace transform method  $\frac{d^2 x}{dt^2} - 2 \frac{dx}{dt} + x = e^t$  with  $x = 2$ ,  $\frac{dx}{dt} = -1$  at  $t = 0$ . (07 Marks)

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