

CBCS Scheme

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15MAT21

Second Semester B.E. Degree Examination, June/July 2016 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: $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$. (05 Marks)
- b. Solve $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$, using inverse differential operator method. (05 Marks)
- c. Solve: $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$ by the method of variation of parameters. (06 Marks)

OR

- 2 a. Solve: $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 1 + 3x + x^2$, using inverse differential operator method. (05 Marks)
- b. Solve: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \cos x$, using inverse differential operator method. (05 Marks)
- c. Solve: $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = x^2 + e^x$ by the method of undetermined coefficients. (06 Marks)

Module-2

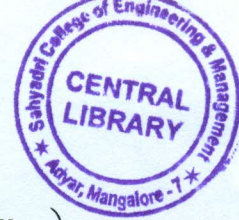
- 3 a. Solve: $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = (1+x)^2$ (06 Marks)
- b. Solve: $y \left(\frac{dy}{dx} \right)^2 + (x-y) \frac{dy}{dx} - x = 0$. (05 Marks)
- c. Solve: $y = 2px + p^2y$ by solving for x. (05 Marks)

OR

- 4 a. Solve: $(3x+2)^2 y'' + 3(3x+2)y' - 36y = 8x^2 + 4x + 1$. (06 Marks)
- b. Solve: $y - 2px = \tan^{-1}(xp^2)$ (05 Marks)
- c. Solve the equation $(px - y)(py + x) = 2p$ by reducing it into Clairaut's form by taking a substitution $X = x^2$ and $Y = y^2$. (05 Marks)

Module-3

- 5 a. Obtain the partial differential equation by eliminating the arbitrary functions, given that $z = yf(x) + x\phi(y)$ (05 Marks)
- b. Solve $\frac{\partial^2 u}{\partial x \partial y} = \frac{x}{y}$ subject to the conditions $\frac{\partial z}{\partial x} = \log x$ when $y = 1$ and $z = 0$ when $x = 1$. (05 Marks)
- c. Derive the one dimensional wave equation in the form, $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$ (06 Marks)



OR

- 6 a. Obtain the partial differential equation of the function, $f\left(\frac{xy}{z}, z\right) = 0$. (05 Marks)
- b. Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$, subject to the conditions $z = 1$ and $\frac{\partial z}{\partial x} = y$ when $x = 0$. (05 Marks)
- c. Derive the one dimensional heat equation in the form $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$. (06 Marks)

Module-4

- 7 a. Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz \, dz \, dy \, dx$. (06 Marks)
- b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy \, dy \, dx$ by changing the order of integration. (05 Marks)
- c. Obtain the relation between beta and gamma function in the form,
 $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (05 Marks)

OR

- 8 a. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} \, dx \, dy$ by changing into polar co-ordinates. (06 Marks)
- b. Find the area enclosed by the curve $r = a(1 + \cos\theta)$ above the initial line. (05 Marks)
- c. Prove that $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} \times \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta} \, d\theta = \pi$ (05 Marks)

Module-5

- 9 a. Evaluate : (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L\{t^2 e^{-3t} \sin 2t\}$ (06 Marks)
- b. If $f(t) = \begin{cases} t, & 0 \leq t \leq a \\ 2a - t, & a \leq t \leq 2a \end{cases}$, $f(t+2a) = f(t)$ then show that $L[f(t)] = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right)$. (05 Marks)
- c. Solve by using Laplace transforms,
 $\frac{d^2 y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0$, $y'(0) = 0$ (05 Marks)

OR

- 10 a. Evaluate $L^{-1}\left\{\frac{4s+5}{(s+1)^2(s+2)}\right\}$. (06 Marks)
- b. Find $L^{-1}\left\{\frac{1}{s(s^2+a^2)}\right\}$ by using convolution theorem. (05 Marks)
- c. Express $f(t) = \begin{cases} 1, & 0 < t \leq 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2 \end{cases}$ in terms of unit step function and hence find its Laplace transform. (05 Marks)
