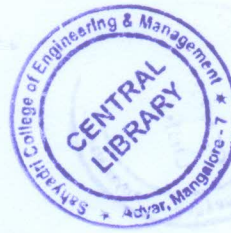


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14MAT21

Second Semester B.E. Degree Examination, Dec.2015/Jan.2016
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 $y'' + 4y' - 12y = e^{2x} - 3\sin 2x$. (06 Marks)
- b. By the method of undetermined coefficients solve $\frac{d^2y}{dx^2} + y = 2 \cos x$. (07 Marks)
- c. Solve by the method of variation of parameters $y'' + 4y = \tan 2x$. (07 Marks)

OR

- 2 a. Solve $\frac{d^4y}{dx^4} + m^4y = 0$. (06 Marks)
- b. Solve $(D^2 + 7D + 12)y = \cos hx$. (07 Marks)
- c. By the method of variation of parameters, solve $y'' + y = x \sin x$. (07 Marks)

Module-2

- 3 a. Solve the simultaneous equations $\frac{dx}{dt} + 2y + \sin t = 0$, $\frac{dy}{dt} - 2x - \cos t = 0$ given that $x = 0$ and $y = 1$ when $t = 0$. (07 Marks)
- b. Solve $x^2 y'' - xy' + 2y = x \sin(\log x)$. (07 Marks)
- c. Solve $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$. (06 Marks)

OR

- 4 a. Solve $(x+a)^2 y'' - 4(x+a)y' + 6y = x$. (07 Marks)
- b. Solve $p = \tan \left(x - \frac{p}{1+p^2} \right)$. (07 Marks)
- c. Find the general and the singular solution of the equation $y = px + p^3$. (06 Marks)

Module-3

- 5 a. Form the Partial Differential Equation of $z = y f(x) + x g(y)$, where f and g are arbitrary functions. (07 Marks)
- b. Derive one dimensional heat equation. (07 Marks)
- c. Evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dx dy$ by changing into polar co-ordinates. (06 Marks)

OR

Important Note : 1. On completing your answers, completely 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.



- 6 a. 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 $\pi/2$. (07 Marks)
- b. Evaluate $\iint_R xy dx dy$, where R is the region bounded by x - axis, the ordinate $x = 2a$ and the parabola $x^2 = 4ay$. (07 Marks)
- c. Evaluate $\int_{-c}^c \int_{-b}^b \int_{-a}^a (x^2 + y^2 + z^2) dz dy dx$. (06 Marks)

Module-4

- 7 a. Define Gamma function and Beta function. Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. (07 Marks)
- b. Express the vector $\vec{F} = z\hat{i} - 2x\hat{j} + y\hat{k}$ in cylindrical co-ordinates. (06 Marks)
- c. Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$. (07 Marks)

OR

- 8 a. Prove that $\beta(m, n) = \frac{\Gamma(m) \Gamma(n)}{\Gamma(m+n)}$. (07 Marks)
- b. Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3} a^2$. (06 Marks)
- c. Prove that the cylindrical co-ordinate system is orthogonal. (07 Marks)

Module-5

- 9 a. Find $L\{e^{-2t} \sin 3t + e^t t \cos t\}$. (07 Marks)
- b. Find the inverse Laplace transform of $\frac{4s+5}{(s-1)^2(s+2)}$. (06 Marks)
- c. Solve $y'' + 6y' + 9y = 12t^2 e^{-3t}$ by Laplace transform method with $y(0) = 0 = y'(0)$. (07 Marks)

OR

- 10 a. Express $f(t) = \begin{cases} \cos t, & 0 < t \leq \pi \\ 1, & \pi < t \leq 2\pi \\ \sin t, & t > 2\pi \end{cases}$ in terms of unit step function and hence find its Laplace transform. (07 Marks)
- b. Solve by Laplace transform $y'' + 6y' + 9y = 12t^2 e^{-3t}$ with $y(0) = 0 = y'(0)$. (06 Marks)
- c. Find $L\left\{\frac{\cos at - \cos bt}{t}\right\}$. (07 Marks)
