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14MAT21

Second Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics – II

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting
at least ONE question from each part.**

Module-1

- 1 a. Solve $(D^2 + 4D + 5)y = -2 \cos h x$. (06 Marks)
- b. Solve $\frac{d^4 y}{dx^4} + m^4 y = 0$. (07 Marks)
- c. Solve, by using method of variation of parameters, $y'' + 4y = \tan 2x$. (07 Marks)
- 2 a. Solve $y''' - 6y'' + 11y' - 6y = 1 + x + \sin x$. (06 Marks)
- b. Solve, by using method of undermined coefficients, $y'' - 3y' + 2y = 4x^2$. (07 Marks)
- c. Solve, by using method of variation of parameters, $(D^2 + 2D + 1)y = e^{-x} \log x$. (07 Marks)

Module-2

- 3 a. Solve, $x^3 y''' + 2x^2 y'' + 2y = 10 \left(x + \frac{1}{x} \right)$. (06 Marks)
- b. Solve, $x^2 p^2 + xy p - 6y^2 = 0$ for p. (07 Marks)
- c. Solve, $(px - y)(py + x) = 2p$ by substituting $X = x^2$, $Y = y^2$ and also find its singular solution. (07 Marks)
- 4 a. Solve $(2x + 3)^2 y'' - 2(2x + 3)y' - 12y = 6x$. (06 Marks)
- b. Solve $y = 2px + y^2 p^3$. (07 Marks)
- c. Solve the following simultaneous linear equations :
 $(D + 4)x + 3y = 1$ and $2x + (D + 5)y = e^1$. (07 Marks)

Module-3

- 5 a. Form a partial differential equation by eliminating arbitrary function, f from the relation :
 $z = f\left(\frac{xy}{z}\right)$. (06 Marks)
- b. Change the order of integration in $I = \int_{y=0}^a \int_{x=y}^a \frac{x}{x^2 + y^2} dx dy$ and hence evaluate the same. (07 Marks)
- c. Solve the one dimensional wave equation $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$ by variable separable method. (07 Marks)

- 6 a. Solve $\frac{\partial^2 z}{\partial y^2} = z$, given that $z = e^x$, $\frac{\partial z}{\partial y} = e^{-x}$ at $y = 0$. (06 Marks)
- b. Change into polar co-ordinates and evaluate : $I = \int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dy dx$. (07 Marks)
- c. Evaluate : $I = \int_{x=1}^3 \int_{y=\frac{1}{x}}^1 \int_{z=0}^{\sqrt{x}} xyz dz dy dx$. (07 Marks)

Module-4

- 7 a. By using double integral, find the area bounded by the co-ordinate axes and the line $x + y = 2$. (06 Marks)
- b. State and prove the relation between Beta and Gamma functions. (07 Marks)
- c. Find the spherical polar co-ordinate system defined by $x = r \sin \theta \cos \phi$, $y = r \sin \theta \sin \phi$, $z = r \cos \theta$ and also prove that spherical polar co-ordinate system is orthogonal. (07 Marks)
- 8 a. Find the volume of the sphere $x^2 + y^2 + z^2 = a^2$ by using triple integral. (06 Marks)
- b. Evaluate : $\int_0^a x^4 \sqrt{a^2 - x^2} dx$ by using Beta and Gamma functions. (07 Marks)
- c. Derive expression for $\text{div } \vec{A}$ in orthogonal curvilinear coordinates. (07 Marks)

Module-5

- 9 a. Find : $L(e^{-t} \sin 6t + t \cos 3t)$. (06 Marks)
- b. Find : $L^{-1} \left\{ \frac{s-1}{s(s^2-2s+5)} \right\}$. (07 Marks)
- c. Solve, by using Laplace transforms, $y''' + 2y'' - y' - 2y = 0$, where $y = 1$, $\frac{dy}{dt} = 2 = \frac{d^2y}{dt^2}$ at $t = 0$. (07 Marks)
- 10 a. Evaluate : $\int_0^{\infty} t e^{-3t} \cos 2t dt$. by using Laplace transforms. (06 Marks)
- b. If $f(t) = \begin{cases} E \sin \omega t, & 0 < t < \frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} \end{cases}$ is periodic function then find $L(f(t))$. (07 Marks)
- c. Find: $L^{-1} \left(\frac{s}{(s-1)(s^2+4)} \right)$ using convolution theorem. (07 Marks)