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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

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 $f(t) = \begin{cases} \cos t, & 0 < t \le \pi \\ 1, & \pi < t \le 2\pi \\ \sin t, & t > 2\pi \end{cases}$

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)**

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