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14MAT21

Second Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics – II

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting ONE full question from each module.

Module – 1

- 1 a. Solve $(D^2 - 3D + 2)y = (e^{3x} + \sin x)$. (06 Marks)
- b. Solve $(D^2 + 2D + 1)y = (x^2 + 3x + 2)$. (07 Marks)
- c. By the method of undetermined coefficients solve $(D^2 + D + 1)y = 6e^x + \cos x$. (07 Marks)
- 2 a. Solve $(D^3 - 6D^2 + 11D - 6)y = e^{-x}$. (06 Marks)
- b. Solve $(D^2 - 1)y = x^2$. (07 Marks)
- c. By the method of variation of parameters solve $(D^2 - 2D + 1)y = e^x$. (07 Marks)

Module – 2

- 3 a. Solve the simultaneous equations,
 $\frac{dx}{dt} = 5x + y$, $\frac{dy}{dt} = y - 4x$ (06 Marks)
- b. Solve $x^2 y'' - xy' + y = \log x$. (07 Marks)
- c. Solve $xyp^2 - (x^2 + y^2)p + xy = 0$. (07 Marks)
- 4 a. Solve $(1+x)^2 y'' + (1+x)y' + y = \sin[2 \log(1+x)]$. (06 Marks)
- b. Solve $y + px = x^4 p^2$. (07 Marks)
- c. Find the general and singular solution of the equation, $\sin px \cos y = \cos px \sin y + p$. (07 Marks)

Module – 3

- 5 a. Form the partial differential equation by eliminating arbitrary function from,
 $F(x+y+z, x^2 + y^2 + z^2) = 0$ (06 Marks)
- b. Derive one dimensional heat equation. (07 Marks)
- c. Evaluate $\int_0^1 \int_1^2 \int_2^3 (x + y + z) dx dy dz$. (07 Marks)
- 6 a. Solve $\frac{\partial^2 z}{\partial x \partial y} = \frac{x}{y} + a$. (06 Marks)
- b. Evaluate by changing the order of integration, $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$. (07 Marks)
- c. Find all possible solutions of one dimensional wave equation, $u_{tt} = C^2 u_{xx}$ by the method of separation of variables. (07 Marks)

Module – 4

- 7 a. Evaluate $\int_0^{\infty} e^{-4x} x^2 dx$ using gamma function. (06 Marks)
- b. Prove that spherical polar co-ordinate system is orthogonal. (07 Marks)
- c. Find the area enclosed by the curve $r = a(1 + \cos\theta)$ above the initial line. (07 Marks)
- 8 a. Show that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (06 Marks)
- b. Express the vector, $F = zi - 2xj + yk$ in cylindrical co-ordinates. (07 Marks)
- c. Find the volume of the solid bounded by the planes $x = 0$, $y = 0$, $x + y + z = 1$ and $z = 0$. (07 Marks)

Module – 5

- 9 a. Find the Laplace transform of $t \cos 2t + e^{-2t} t^3$. (06 Marks)
- b. Express $f(t) = \begin{cases} \sin t, & 0 < t \leq \frac{\pi}{2} \\ \cos t, & \frac{\pi}{2} < t < \pi \\ 0, & t > \pi \end{cases}$ in terms of unit step function and hence find its Laplace transform. (07 Marks)
- c. Solve $y'' - 3y' + 2y = e^{-t}$, $y(0) = y'(0) = 0$ by Laplace transform method. (07 Marks)
- 10 a. Find the inverse Laplace transforms of $\frac{3s+7}{s^2-2s-3} + \log\left(\frac{s-a}{s+b}\right)$. (06 Marks)
- b. Using convolution theorem find the inverse Laplace transform of $\frac{1}{s(s^2+a^2)}$. (07 Marks)
- c. Find the Laplace transform of the periodic function, $f(t) = \begin{cases} K, & 0 \leq t \leq a \\ -K, & a < t \leq 2a \end{cases}$, period is $2a$. (07 Marks)

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