USN

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 $\left(D^2 - 3D + 2\right)y = (e^{3x} + \sin x)$. **(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,
$\dfrac{dx}{dt} = 5x + y$, $\dfrac{dy}{dt} = y - 4x$ **(06 Marks)**

b. Solve $x^2y'' - xy' + y = \log x$. **(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 $y + px = x^4p^2$. **(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 $\dfrac{\partial^2 z}{\partial x \partial y} = \dfrac{x}{y} + a$. **(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, $u_{tt} = C^2u_{xx}$ by the method of separation of variables. **(07 Marks)**

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

Module – 4

7 a. Evaluate $\int_0^\infty e^{-4x}x^2dx$ 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 $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(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 $f(t) = \begin{cases} \sin t, & 0 < t \le \frac{\pi}{2} \\ \cos t, & \frac{\pi}{2} < t < \pi \\ 0, & t > \pi \end{cases}$

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 $\dfrac{3s+7}{s^2-2s-3} + \log\left(\dfrac{s-a}{s+b}\right)$. **(06 Marks)**

b. Using convolution theorem find the inverse Laplace transform of $\dfrac{1}{s(s^2+a^2)}$. **(07 Marks)**

c. Find the Laplace transform of the periodic function, $f(t) = \begin{cases} K, & 0 \le t \le a \\ -K, & a < t \le 2a \end{cases}$, period is 2a. **(07 Marks)**

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