14MA201

Hall Ticket Number:

I/IV B. Tech (Supplementary) DEGREE EXAMINATION

November, 2019 — **Common to all branches**

Second Semester — **Engineering Mathematics – II**

Time: Three Hours — **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1 Answer all questions (1X12=12 Marks)

a) Solve the differential equation $y' = 1 + y^2$.

b) Write the condition for exact differential equation.

c) Define orthogonal trajectories.

d) Solve the differential equation $\frac{d^2y}{dx^2} + 4y = 0$

e) Write the general form of Euler-Cauchy equation.

f) Write the differential equation of R-L-C circuit with an e.m.f $E\sin\omega t$

g) Find $L(\sin^2 4t)$

h) Define Dirac delta function.

i) State Convolution theorem.

j) Find the normal vector to the surface $x^2 + 3y^2 + z^2 = 28$ at the point (4,1,3)

k) Find the values of a,b,c so that $\overline{A} = (x + 2y + az)\,i + (bx - 3y - z)\,j + (4x + cy + 2z)\,k$ is irrotational.

l) State Green's theorem.

UNIT I

2 a) Solve the initial value problem $(\cos y \sinh x + 1)\,dx - \sin y \cosh x\,dy = 0, \quad y(1) = 2$ 6M

b) A thermometer, reading 10^{0}C, is brought into a room whose temperature is 23^{0}C. Two minutes later the thermometer reading is 18^{0}C. How long does it take until the reading is practically 22.8^{0}C. 6M

(OR)

3 a) Solve $(1 + y^2)dx = (\tan^{-1} y - x)dy$ 6M

b) The magnitude for natural substance increases from 70 to 150 units in 15 minutes. Find the time required for the magnitude to be 225 units. Also find the magnitude of the substance after 10 minutes. 6M

UNIT II

4 a) Solve the initial value problem $y'' + 0.4y' + 9.04y = 0, \quad y(0) = 0, \quad y'(0) = 3.$ 6M

b) Using the method of variation of parameters find the general solution of $\frac{d^2y}{dx^2} + a^2 y = \cos ec\, ax$ 6M

(OR)

5 a) Solve the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2 + 3e^{-x}$ by the method of undetermined coefficients. 6M

b) Solve the differential equation $x^2 y'' + 0.6xy' + 16.04y = 0.$ 6M

UNIT III

6 a) Evaluate $\int_0^\infty \frac{e^{-t}\sin^2 t}{t}\,dt$ 6M

b) Solve $\frac{d^2x}{dt^2} + 9x = \cos 2t,$ if $x(0) = 1, \quad x\left(\frac{\pi}{2}\right) = -1$ using Laplace transforms. 6M

(OR)

7 a) Find the inverse Laplace transform of $\tan^{-1}\left[\dfrac{2}{s^2}\right]$ 6M

b) Using convolution theorem find $L^{-1}\left(\dfrac{s}{(s^2+a^2)^2}\right)$ 6M

UNIT IV

8 a) Find the directional derivative of $f = 2x^2 + 3y^2 + z^2$ at the point $P(2,1,3)$ in the direction of **a** = $[1, 0, -2]$. 6M

b) Show that the integral $\int_C F \bullet dr = \int_C (2xdx + 2y\ dy + 4zdz)$ is path independent in any domain in space and find its value in the integration from A: (0,0,0) to B: (2,2,2). 6M

(OR)

9 a) Verify stokes theorem for the vector field $\overline{F} = (2x - y)i - yz^2 j - y^2 z\overline{k}$ over the upper half of the sphere $x^2 + y^2 + z^2 = 1$ bounded by its projection on *xy*-plane. 6M

b) Using Gauss divergence theorem evaluate $\iint_S F.n\ ds$ for $\overline{F} = yi + xj + z^2\overline{k}$ over the cylinder region bounded by $x^2 + y^2 = 9$, $z = 0$ & $z = 2$. 6M