B.Tech I Year I Semester (R15) Supplementary Examinations June 2016

MATHEMATICS – I

(Common to CE, EEE, CSE, ECE, ME, EIE and IT)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Find an integrating factor so that $\frac{dy}{dx} = \frac{y}{x} + \frac{x^2+y^2}{x^2}$ be an exact differential equation.

(b) Solve $(D^3 - 1)y = 0$.

(c) If the complementary function of $(D^2 + 1)y = x \sin x$ is $y = A\cos x + B\sin x$ then find A.

(d) Roots of the auxiliary equation for $\left(LD^2 + RD + \frac{1}{c}\right)q = E\sin pt$.

(e) If $u = e^{x+y}, v = e^{-x+y}$ then find Jacobian.

(f) Find the radius of curvature at any point of the cardioids is $s = 4a\sin\frac{\Psi}{3}$.

(g) Evaluate $\int_0^1\int_0^1 \frac{dx\,dy}{\sqrt{1-x^2}\sqrt{1-y^2}}$.

(h) Find the quadrature of the curve $y = \sin x$ from $x = 0$ to $x = \pi$.

(i) Find $\nabla^2 r^n$.

(j) Evaluate $\int_c xdy - ydx$ around the circle $C: x^2 + y^2 = 1$.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Find the orthogonal trajectories of the family of cardioids $r = a(1 - \cos\theta$ where ‘a’ is a parameter.

OR

3 Solve $(D^2 - 4D)y = e^x + \sin 3x \cos 2x$.

UNIT – II

4 Solve the equation using method of variation of parameters: $(D^2 + 3D + 2)y = e^x + x^2$.

OR

5 A horizontal beam is uniformly loaded. It’s one end is fixed the other end is subjected to a tensile force P. The deflection of the beam is given by $\mathrm{EI}\frac{d^2y}{dx^2} = py - \frac{1}{2}wx^2$. Given that $\frac{dy}{dx} = 0$ at $x = 0$, show that the deflection of the beam for a given x is $y = \frac{w}{px^2}(1 - \cosh nx) + \frac{wx^2}{2p}$, where $x^2 = \frac{p}{EI}$.

UNIT – III

6 Find the point on the $lx + my + nz = P$ which is nearest to the origin.

OR

7 Find the radius of curvature at $(-2, 0)$ on the curve $y^2 = x^3 + 8$.

UNIT – IV

8 Evaluate $\int_0^1\int_0^{\sqrt{1-x^2}} y^2\,dxdy$ by changing the order of integration.

OR

9 Find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

UNIT – V

10 Evaluate $\int_c [(2xy^3 - y^2\cos x)dx + (1 - 2y\sin x + 3x^2y^2)dy]$ where C is the arc of the parabola $2x = \pi y^2$ from (0, 0) to $\left(\frac{\pi}{2}, 1\right)$.

OR

11 Verify Gauss’s divergence theorem for $\bar{F} = (x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$ taken over the rectangular parallelepiped $0 \le x \le a, 0 \le y \le b, 0 \le z \le c$.

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