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 $y=\sin x \text{ from } x=0\ to\ x=\pi$.

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

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

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 $y=\frac{w}{px^2}(1-\cos h\,nx)+\frac{wx^2}{2p}$, 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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