Code: 15A54101 **R15**

B.Tech I Year I Semester (R15) Regular & Supplementary Examinations December 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 the orthogonal trajectories of the family of parabolas through the origin and foci on the $y-axis$.

(b) Find the complementary function $(D^3+2D)y=e^{2x}+\cos(3x+7)$.

(c) $x^2\frac{d^2y}{dx^2}+3x\frac{dy}{dx}=0$ has the general solution _____

(d) Find P.I$\left(\theta^2-4\theta+1\right)^{-1}\sin z$.

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

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

(g) $\int_D\int(x^2+y^2)dxdy=$ _____ $D: y=x, y^2=x$.

(h) Evaluate $\int_0^1 dx\int_1^2 dy\int_1^3 xyzdz$.

(i) $\nabla\times\left(\nabla\times\overline{A}\right)$ is_____

(j) Evaluate $\int_c y^2dx-2x^2dy$ along the parabola $y=x^2$ from $(0,0)$to $(2,4)$.

PART – B

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

UNIT – I

2 Solve: $x(x-1)\frac{dy}{dx}-y=x^2(x-1)^3$.

OR

3 Solve: $(D^3+2D^2-3D)y=xe^{3x}$.

UNIT – II

4 Solve: $(D^2+a^2)y=\tan ax$ by the method of variation of parameters.

OR

5 The deflection y of a strut of length l with one end built-in and other end subjected to the end thrust P, satisfies $\frac{d^2y}{dx^2}+a^2y=\frac{a^2R}{P}(1-x)$. Find the deflection y of the strut at a distance x from the built-in end.

UNIT – III

6 (a) If $u=\sin^{-1}\left(\frac{x^2y^2}{x+y}\right)$ then show that $xu_x+yu_y=3\tan u$.

(b) If $u=x+y+z, uv=y+z, uvw=z$, then prove $\frac{\partial(x,y,z)}{\partial(u,v,w)}=u^2v$.

OR

7 (a) Find the points on the surface $z^2=xy+1$ nearest to the origin.

(b) Find the radius of curvature at $(3,3)$ on the curve $x^3+xy^2-6y^2=0$.

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UNIT – IV

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

OR

9 Evaluate $\int\int\int xy^2 z dxdydz$ taken through the positive octant of the sphere: $x^2 + y^2 + z^2 = a^2$.

UNIT – V

10 (a) Find the directional derivative of $f = xy + yz + zx$ in the direction of vector $\bar{i} + 2\bar{j} + 2\bar{k}$ at the point $(1, 2, 0)$.

(b) Find curl $\bar{f}$ where $\bar{f} = \text{grad}\,(x^3 + y^3 + z^3 - 3xyz)$.

OR

11 Evaluate by Green's theorem $\oint_c (y - \sin x)dx + \cos x\, dy$ where C is triangle enclosed the lines $y = 0, x = \frac{\pi}{2}, \pi y = 2x$.

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