Code: 15A54101

R15

B.Tech I Year I Semester (R15) Supplementary Examinations June 2018

MATHEMATICS – I

(Common to all branches)

Time: 3 hours | Max. Marks: 70

PART – A

(Compulsory Question)

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

(a) Solve $[cosx\ tany + \cos(x+y)]dx + [sinx\ sec^2y + \cos(x+y)]dy = 0$.

(b) Solve $(x+1)\frac{dy}{dx} - y = e^x(x+1)^2$.

(c) Find the particular integral of $(D^2 + 4D + 4)y = \frac{e^{-2x}}{x^2}$.

(d) Solve $(x^2D^2 - xD + 1)y = 0$.

(e) Find the radius of curvature for the curve $y = 4sinx - sin2x\ \ at\ \ x = 90°$.

(f) If $u = \frac{y^2}{x},\ v = \frac{x^2}{y}$ find $\frac{\partial(u,v)}{\partial(x,y)} = ?$

(g) Evaluate $\int_0^a \int_0^{\sqrt{ay}} xy\ dx\ dy$.

(h) Evaluate $\int_0^{\pi} \int_0^{acos\theta} rsin\theta\ dr\ d\theta$.

(i) Find the unit vector normal to the surface $x^2 - y^2 + z = 2$ at the point $(1,-1,2)$.

(j) Show that $\vec{F} = (y^2 + 2xz^2)\vec{\imath} + (2xy - z)\vec{\jmath} + (2x^2z - y + 2z)\vec{k}$ is irrotational.

PART – B

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

UNIT – I

2 (a) Solve $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = x^2 + 3$.

(b) Prove that the system of confocal and coaxial parabolas $y^2 = 4a(x+a)$ is self orthogonal.

OR

3 (a) Solve $(D^2 + 4D + 3)y = e^x sinx$.

(b) Solve $\frac{dy}{dx} + \frac{x}{1-x^2}y = x\sqrt{y}$.

UNIT – II

4 Solve $\frac{d^2y}{dx^2} + y = cosee\ x$ by using method of variation of parameters.

OR

5 Solve $(x+2)^2\frac{d^2y}{dx^2} - (x+2)\frac{dy}{dx} + y = 3x + 4$.

UNIT – III

6 (a) Expand $\sin(xy)$ in powers of $(x-1)$ and $(y - \pi/2)$ upto second degree terms.

(b) Discuss the maximum and minimum of $f(x,y) = x^3 + y^3 - 12x - 3y + 20$.

OR

7 (a) If $x = rsin\theta\ cos\theta,\ y = rsin\theta\ sin\phi$ and $z = rcos\theta$ find $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}$.

(b) Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube.

UNIT – IV

8 (a) Evaluate $\iint_R (x^2 + y^2)dxdy$, where R is the square $0 \le x \le a,\ 0 \le y \le a$.

(b) Transform the integral into polar-co-ordinates and hence evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2+y^2}\,dy\,dx$.

OR

9 (a) Change the order of integration in $\int_0^a \int_x^a (x^2+y^2)dy\,dx$ and then evaluate.

(b) Find the area included between the curves $y^2 = 4x$ and $x^2 = 4y$.

UNIT – V

10 (a) If $\vec{F} = (3x^2 + 6y)\vec{\imath} - 14yz\,\vec{\jmath} + 20xz^2\,\vec{k}$, evaluate $\int_C \vec{F}.\vec{dr}$ where C is the straight line joining (0,0,0) to (1,1,1).

(b) Using Stokes theorem, evaluate $\int_C \vec{F}.\vec{dr}$ for the function $\vec{F} = x^2\,\vec{\imath} + xy\,\vec{\jmath}$ in XOY-plane bounded by $x = 0,\ y = 0,\ x = a,\ y = a$.

OR

11 Verify Divergence theorem for $\vec{F} = (x^2 - yz)\vec{\imath} + (y^2 - zx)\vec{\jmath} + (z^2 - xy)\vec{k}$ taken over the rectangular parallelepiped $x = 0,\ x = 1,\ y = 0,\ y = 2,\ z = 0\ and\ z = 3$.

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