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Subject Code-: R10102/R10 **Set No - 1**

I B.Tech I Semester Supplementary Examinations June - 2012

MATHEMATICS – I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) Solve (i) $\frac{ydx - xdy}{x^2} + e^y dy = 0$ (ii) $\frac{ydx - xdy}{xy} + 2x\sin x^2 dx = 0$

(b) Find the orthogonal trajectories of the family of parabolas through origin and foci on y-axis

[8M + 7M]

2. Solve $(D^3 + 2D^2 + D)y = e^{2x} + x^2 + x + \sin 2x$

[15M]

3.(a) Using Rollis Theorem show that $g(x) = 8x^3 - 6x^2 - 2x + 1$ has a zero between 0 and 1.

(b) If $u = \frac{yz}{x}, v = \frac{xz}{y}, w = \frac{xy}{z}$ find $\frac{\partial(u, v.w)}{\partial(x, y, z)}$.

[8M + 7M]

4.(a) Trace the curve $r = a\sin 2\theta$

(b) Trace the curve $x^{2/3} + y^{2/3} = a^{2/3}$

[8M + 7M]

5.(a) Find length of the arc of the parabola $y^2=4ax$ measured from the vertex to both extremities of the latus rectum.

(b) Find the volume formed by the revolution of the loop of the curve $y^2(a + x) = x^2(3a - x)$ about x-axis.

[8M + 7M]

6.(a) Evaluate the integral by changing the order of integration $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$

(b) Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dxdydz$

[8M + 7M]

7.(a) Find div. $\bar{f}$ when $\bar{f} = \text{grad } (x^3 + y^3 + z^3 - 3xyz)$

(b) Show that the vector $(x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)\bar{k}$ is irrotational and find its scalar potential.

[8M + 7M]

8. Verify stokes theorem for $\bar{f} = -y^3 i + x^3 j$, where s is the circular disc $x^2 + y^2 \le 1, z = 0$

[15M]

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Set No - 2

Subject Code-: R10102/R10

I B.Tech I Semester Supplementary Examinations June - 2012

MATHEMATICS – I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions

All Questions carry equal marks

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1.(a) Solve $\frac{xdy}{dx} + y = x^2 y^6$.

(b) Find the orthogonal trajectories of family of curves given by $y = Kx^2$, where K is arbitrary.

[8M + 7M]

2.(a) Solve $(D^2 + 4D + 4)y = e^{-x} \sin 2x$.

(b) Solve $(D^2 + 9)y = \cos 3x$.

[8M + 7M]

3.(a) Find the maximum and minimum values of $f(x) = x^3 + y^3 - 3axy$.

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

[8M + 7M]

4.(a) Trace the curve $y^2 = (x-2)(x-4)^2$.

(b) Trace the curve $x = a(\theta - \sin\theta), y = a(1+\cos\theta)$.

[8M + 7M]

5.(a) Find the length of the curve $3x^2 = y^3$ between y=0 and y=1

(b) Find the surface area of the solid formed by revolving the cardiod $r = a(1-\cos\theta)$ about the initial line.

[8M + 7M]

6.(a) Evaluate $\int\int r\sin\theta drd\theta$ over the cardiod $r = a(1-\cos\theta)$ above the initial line.

(b) Evaluate $\iiint_V dxdydz$ where V is the region banded by the planes x=0, y=0, z=0 and 2x+3y+4z = 12.

[8M + 7M]

7.(a) Find a unit normal vector to the given surface $x^2y + 2xz = 4$ at the point (2,-2,3).

(b) Prove that div $(\bar{a} \times \bar{b}) = \bar{b}.\text{ curl } \bar{a} - \bar{a}.\text{ curl } \bar{b}$

[8M + 7M]

8. Verify Green's theorem for $\int_c \left[(3x^2 - 8y^2)dx + (4y - 6xy)dy\right]$ where C is the region bounded by x=0, y=0 and x+y=1.

[15M]

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Set No - 3

Subject Code-: R10102/R10

I B.Tech I Semester Supplementary Examinations June - 2012

MATHEMATICS – I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions

All Questions carry equal marks

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1.(a) Solve $\frac{dy}{dx} + y = y^2 \log x$.

(b) If the air is maintained at 15^0c and the temperature of the body drops from 70^0c to 40^0c in 10 minutes, what will be its temperature after 30 minutes.

[8M + 7M]

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

(b) Solve $(D^2 + 2D + 2)y = e^{-x} + \sin 2x$.

[8M + 7M]

3.(a) Examine whether Rolle's theorem is applicable for the function $f(x) = \tan x$ in $(0, \pi)$.

(b) Find the shortest distance from the point (1,0) to the parabola $y^2 = 4x$.

[8M + 7M]

4.(a) Trace the curve $r = a\cos 2\theta$

(b) Trace the curve $y = a\cosh x/a$

[8M + 7M]

5.(a) Find the area of surface of revolution generated by revolving one arc of the curve $y = \sin x$ about x-axis.

(b) Find entire length of the curve $x = a\cos^3\theta$, $y = a\sin^3\theta$.

[8M + 7M]

6.(a) Evaluate $\iint_R xy\,dx\,dy$ where R is the region bounded by x-axis, ordinate x=2a and the curve $x^2=4ay$.

(b) Change the order of integration $\int_0^{\pi/2} \int_0^{2a\cos\theta} f(r,\theta)\,dr\,d\theta$.

[8M + 7M]

7.(a) Find the directional derivative of $2xy + z^2$ at (1,-1,3) in the direction of i+2j+3k.

(b) Prove that curl (grad ϕ) = $\bar{0}$.

[8M + 7M]

8. Verify stokes theorem for $\bar{F} = y\bar{i} + z\bar{j} + x\bar{k}$ and surface is part of the sphere $x^2 + y^2 + z^2 = 1$ above xy – plane.

[15M]

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Set No - 4

Subject Code-: R10102/R10

I B.Tech I Semester Supplementary Examinations June - 2012

MATHEMATICS – I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions
All Questions carry equal marks
*** * * * ***

1.(a) Solve $1+y^2+(x-e^{\tan^{-1}y})\frac{dy}{dx}=0$

(b) Find the orthogonal trajectories of the cardiods $r=a(1-\cos\theta)$ for different values of a.

[8M + 7M]

2.(a) Solve the differential equation $(D^2+1)y=\sin x\sin 2x$.

(b) Solve $(D^2+4D+4)y=e^{-x}\sin 2x$

[8M + 7M]

3.(a) If $u=x^2-2y,\quad v=x+y+z,\quad w=x-2y+3z$, find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$

(b) Obtain the expansion of $e^x\sin y$ in powers of x and y.

[8M + 7M]

4.(a) Trace the curve $y^2(a-x)=x^3 (a>0)$

(b) Trace the curve $r=a(1+\cos\theta)$.

[8M + 7M]

5.(a) Find the length of the arc of the parabola $x^2=4ay$ from vertex to one extremity of the latus rectum.

(b) Find the volume formed by the revolution of the loop of the curve $y^2(a+x)=x^2(3a-x)$ about x-axis.

[8M + 7M]

6.(a) Evaluate $\iint (x^2+y^2)dxdy$ in the positive quadrant for which $x+y\le 1$.

(b) Change the order of integration and evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} dydx$.

[8M + 7M]

7.(a) Find the values of a and b so that the surfaces $ax^2-byz=(a+2)x$ and $4x^2y+z^3=4$ may intersect orthogonally at the point (1,-1,2).

(b) Prove that curl $(\phi\bar{a})=(grad\,\phi)x\ \bar{a}+\phi$ curl $\bar{a}$.

[8M + 7M]

8. Verify Gauss divergence theorem for $\bar{F}=(x^3-yz)\bar{i}-2x^2y\bar{j}+z\bar{k}$ taken over the surface of the cube bounded by planes x = y = z = a and co-ordinate planes.

[15M]

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