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

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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) If 30% of a radioactive substance disappear in 10 days, how long will it take for 90% of it to disappear?
   (b) Solve the D.E $(\cos^3 x) y^1 + y\cos x = \sin x$

   [8+7]

2. (a) Solve the D.E (D^2-4) y= e^{2x}+ sin2x
   (b) Solve the D.E (D^2-4D+2) y= x^2 e^{2x}+ cos2x

   [8+7]

3. (a) Verify whether $u = \dfrac{x+y}{1-xy}$ & $v = \tan^{-1}(x) + \tan^{-1}(y)$ are functionally depended or independent.
   (b) Find Taylor series expansion for $\tan^{-1}(y/x)$ about (1,1)

   [8+7]

4. (a) Trace the curve $xy^2=a^2(x-a)$ (a>0)
   (b) Trace the curve r = a(1+cosθ)

   [8+7]

5. (a) Find the perimeter of the curve r =a(cosθ +sinθ)
   (b) Find the volume of the solid generated by revolution of x = $a\cos^3\theta$, y = $\sin^3\theta$ about its x-axis.

   [8+7]

6. (a) By change of order of integration evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} (x^2+y^2)dxdy$
   (b) Evaluate $\iiint xyz\,dxdydz$ over a positive octant of a sphere with centre zero and radius a.

   [8+7]

7. (a) Find the directional derivative of f = x^3y^2z at (1,2,3) along the direction of $9\vec{i} + 3\vec{j} + \vec{k}$
   (b) Prove that curl(curlf) = grad divf - $\nabla^2 f$

   [8+7]

8. Verify Stokes theorem for f = y^2i+yj-zxk and S is the upper half of the surface $x^2+y^2+z^2=a^2$ and $z \geq 0$.

   [15]

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Subject Code: R10102/R10 **Set No - 2**

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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 the D.E $xy^1-2y=xy^4$
   (b) Find the orthogonal trajectories of the system of curves $\left(\frac{dy}{dx}\right)^2 = a/x$

[8+7]

2. (a) Solve the D.E $(D^2+3D+2)\ y = x^2+e^{-x}$
   (b) Solve the D.E $(D^2-4D+3)\ y = e^x \cos 2x$

[8+7]

3. (a) Find Taylor series expansion for e^{x+y} about (1,1)
   (b) Discuss the maxima or minima of sinx + siny + sin(x+y)

[8+7]

4. (a) Trace the curve $xy^2=4a^2(2a-x)$ (a>0)
   (b) Trace the curve $r= a(1-\cos\theta)$

[8+7]

5. (a) Find the length of the arc of the curve $x =a(\cos\theta +\theta\sin\theta)$, $y =a(\sin\theta-\theta\cos\theta)$ from $\theta = 0$ to any point on the curve.
   (b) Find the volume of the solid generated by revolution of ellipse about its minor axis.

[8+7]

6. (a) By change of order of integration evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} xydxdy$
   (b) Evaluate $\iiint xy^2 zdxdydz$ over a positive octant of a sphere with centre zero and radius a.

[8+7]

7. (a) Find the directional derivative of $f = x^2-2y^2+z=2$ at (1,-1,2) along the direction of i+3j+2k.
   (b) Prove that $grad(f.g) = f \times curl\, g + g \times curl f + (f.\nabla)g + (g.\nabla)f$

[8+7]

8. Verify Stokes theorem for $f = (x^2-y^2)i+2xyj$ and C is the rectangle in the xy-plane bounded by x =0 , x= a ,y = 0 ,y = b.

[15]

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Subject Code: R10102/R10 **Set No - 3**

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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 the D.E $e^y dx + (xe^y + 2y)dy = 0$.
   (b) If the temperature of air is $20^0 C$ and the temperature of the body drops from $100^0 C$ to $80^0 C$ in 10 minutes. What will be its temperature after 20 minutes. When will be the temperature $40^0 C$

[8+7]

2. (a) Solve the D.E $(D^2-4D+4)y = e^{2x} + x^3$
   (b) Solve the D.E $(D^2+1)\, y = x\cos x$

[8+7]

3. (a) Find the points on the surface $z^2=xy+1$ nearest to origin
   (b) Prove that $J.J^1 = 1$ for $x = u(1-v)$, $y = uv$

[8+7]

4. (a) Trace the curve $x = a(\theta + \sin\theta)$, $y = a(1-\cos\theta)$
   (b) Trace the curve $r = a\sin 2\theta$

[8+7]

5. (a) Find the length of the arc of the curve $y^3 = ax^2$ from (0,0) to (a/8,a/4)
   (b) Find the surface of the solid generated $r^2 = a^2 \cos 2\theta$ about the initial line.

[8+7]

6. (a) By change of order of integration evaluate $\int_0^1 \int_{x^2}^{2-x} xy\,dx\,dy$
   (b) Evaluate $\int_0^e \int_0^{\log y} \int_0^{e^x} \log z\,dz\,dx\,dy$

[8+7]

7. (a) Find the directional derivative of $f = x^3y^2z^2 = 4$ at (-1,-1,2) along the direction of 4i+3j+2k
   (b) Prove that curl(gradφ) = 0 , where φ is a scalar point function

[8+7]

8. Verify Green's theorem for $f = (x^2+y^2)i - 2xyj$ and C is the rectangle in the xy-plane bounded by $x = 0$, $x = a$, $y = 0$, $y = b$.

[15]

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Subject Code: R10102/R10 **Set No - 4**

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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) The number of N of bacteria in a culture grew at a rate proportional to N. Thevalue of N was initially 100 and increased to 332 in one hour. What was the value of N after 3/2 hours.
   (b) Solve the D.E y(xy+1)dx+x(1-xy)dy=0

[8+7]

2. (a) Solve the D.E $(D^2-4D+3)y= \sin3x\cos2x$
   (b) Solve the D.E $(D^2-1)y= x^2 + x\sin x$

[8+7]

3. (a) Find Taylor series expansion for $e^x \cos y$ about $(1,\pi/4)$
   (b) Find the minima value of $x^2+y^2+z^2$ given that ax + by + cz = p by Lagrange's method of multipliers.

[8+7]

4. (a) Trace the curve $x =a(\theta -\sin\theta), y =a(1+\cos\theta)$
   (b) Trace the curve $r^2= a^2 \sin2\theta$

[8+7]

5. (a) Find the length of the arc of the curve y = log secx from x = 0 to $x =\pi/3$
   (b) Find the surface of the solid generated $r = a(1+\cos\theta)$ about the initial line.

[8+7]

6. (a) By change of order of integration evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy$
   (b) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dzdxdy$

[8+7]

7. (a) Find the directional derivative of f = xy+yz+zx at (1,2,3) along the direction of 3i+4j+5k
   (b) Prove that div(curlf) = 0 where f is a vector function

[8+7]

8. Verify Gauss divergence theorem for $f = yi+xj+z^2k$ for the cylindrical region given by $x^2+y^2 =a^2$, z =0 , z= h.

[15]

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