Code No: R10102/R10

Set No. 1

I B.Tech I Semester Supplementary Examinations, Oct/Nov 2013
MATHEMATICS-I
(Common to Civil Engineering, Electrical & Electronics Engineering, Mechanical Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Chemical Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Aeronautical Engineering, Bio-Technology, Automobile Engineering, Mining and Petroliem Technology)

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. (a)Solve $3y^1 + x\,y = xy^{-2}$
(b) A body kept in air with temperature $25^0\,C$ cools from $140^0\,C$ to $80^0\,C$ in 20 minutes. when will the body cools down to $35^0\,C$ [8+7]

2. (a) Explain the procedure to find Complete solution of second order non homogeneous differential equation with constant coefficients.
(b) Solve $(D^2 - 4)y = x\ Sin\,\lambda\,x$ [8+7]

3. (a)A rectangular box open at the top is to have maximum capacity whose surface area is 108 square ft. Find the dimensions of the rectangular box.
(b)Find the points on the ellipsoid $\frac{x^2}{4} + \frac{y^2}{9} + \frac{z^2}{4} = 1$ that are closest and farthest from the point (2,0,-1). [8+7]

4. (a) Trace the curve x = a (θ + sinθ), y = a (1 − cosθ).
(b) Trace the curve $x^{2/3} + y^{2/3} = a^{2/3}$. [8+7]

5. (a)Find the length of the arc of the curve y =log (secx) from $x = o$ to $\frac{\pi}{3}$.
(b) Find the perimeter of the loop of the curve 3ay^2 =x(x-a)^2. [8+7]

6. (a) Evaluate $\int_0^4 \int_{y^2/4}^{y} \frac{y}{x^2+y^2}$ dx dy.
(b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz$ dzdy dx. [8+7]

7. (a)Prove that div($\overline{r}$/r) = 2/r.
(b) Show that A = (6xy+ z^3)i +(3x^2-z)j +(3x^{2}z^2-y)k is irrotational. Find ϕ such that A = $\nabla\phi$. Prove that div curl f = 0 [8+7]

8. (a)If f = y i + z j + x k, find the circulation of f round the curve C, where C is the circle x^2 +y^2 = 0, z = 0.
(b) If f = (x + y^2)i − 2xj + 2yzk, evaluate$\int_s f.Nds$ where S is the surface of the plane 2x + y + 2z = 6 in the first octant. [8+7]

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Set No. 2

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Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Solve $(y\ \log x - 2) y\, dx = x\ dy$
   (b) Find the orthogonal trajectory of the family of curves $r = \frac{2a}{(1+Cos\,\theta)}$, where 'a' is a parameter [8+7]

2. (a) Solve $(D^2 - 4D + 13)y = e^{2x}$
   (b) Solve $(D^2 - 3\,D + 2)\,y = Cos\,h\,x$ [8+7]

3. (a) Find the dimensions of a open rectangular tank of maximum capacity whose surface area is 54 square feet.
   (b) In a right angled triangle ABC with $\angle B = 90°$, find the maximum of cosA cosB cosC. [8+7]

4. (a) Trace the curve $r^2 = a^2 \cos 2\theta$.
   (b) Trace the curve x = a (θ + sinθ), y = a (1 + cosθ) . [8+7]

5. (a) Find the surface of the solid generated by the revolution of cardioid r=a (1- cosθ) about the initial line.
   (b) Find the surface of the solid generated by the revolution of the ellipse $x^2+4y^2 =$ 16 about its major axis . [8+7]

6. (a)Evaluate $\int\int xydxdy$ over the positive Quadrant of the circle $x^2 + y^2 = a^2$.
   (b)Evaluate $\int\int\int_V (xy + yz + zx)\, dx$ dy dz where V is the region of space bound by $x = 0, x = 1, y = 0, y = 2, z = 0, z = 3$. [8+7]

7. (a)Find the angle between the normals to the surface xy = z^2 at the points (4,1,2) and (3,3,-3).
   (b) Prove that div (r$^n\overline{r}$) = (n+3)r^n [8+7]

8. (a)If f = 3xy i – y^2 j, evaluate $\int_C f.dr$ where C is the curve y =2x^2, in xy plane from (0, 0) to (1,2).
   (b) Evaluate $\int_s f.Nds$, where f = 18zi – 12j + 3yk and S is the part of the plane 2x + 3y + 6z = 12 located in first octant. [8+7]

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Set No. 3

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Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. (a)Solve $3y^1 + x\,y = xy^{-2}$
   (b) A body kept in air with temperature $25^0\,C$ cools from $140^0\,C$ to $80^0\,C$ in 20 minutes. when will the body cools down to $35^0\,C$ [8+7]
2. (a)Solve $(D^2 + a^2)y = Cos\,a\,x$
   (b) Solve $(D - 2)^3 y = e^{2x}$ [8+7]
3. (a)If u $=e^{xyz}$then find $\frac{\partial^3 u}{\partial x \partial y \partial z}$.
   (b) Find the Jacobian of transformation from 3D-Cartesian coordinates to spherical polar coordinates [8+7]
4. (a) Trace the curve x = a (θ + sinθ), y = a (1 − cosθ).
   (b) Trace the curve $x^{2/3} + y^{2/3} = a^{2/3}$ [8+7]
5. (a) Find the volume of the solid generated by revolving one arc of the Cycloid x=a (1-sin t), y=a(1-cos t) about its base.
   (b) Prove that the curved surface area of a sphere of radius r intercepted between two parallel planes at a distance a and b from the centre of the Sphere is $2\pi r(b - a) when$ b > a. [8+7]
6. (a)Evaluate $\int\int xydxdy$ over the positive Quadrant of the circle $x^2 + y^2 = a^2$.
   (b)Evaluate $\int\int\int_V (xy + yz + zx)\,dx$ dy dz where V is the region of space bound by $x = 0, x = 1, y = 0, y = 2, z = 0, z = 3$. [8+7]
7. (a)Find the angle of intersection of the spheres $x^2 + y^2 + z^2 = 4$ and $z = x^2 + y^2 + 3$ at the point (2,-1,1).
   (b) Prove that div grad $r^n = n(n+1)r^{n-2}$. [8+7]
8. (a)Show that the area of the ellipse $x^2/a^2 + y^2/b^2 = 1$ is πab
   (b) If f = $(2x^2 - 3z)i - 2xyj - 4xzk$, evaluate (a) $\int_v \nabla.f dV$ and
   (b) $\int_v \nabla \times f dV$ where V is the closed region bounded by x = 0, y = 0, z = 0, 2x + 2y +z = 4. [8+7]

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Set No. 4

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Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Solve $y(2x^2y^2 + xy)\,dx - x(x^2y^2 - xy)\,dy = 0$
   (b) The number N of bacteria in a culture grew at a rate proportional to N. The number becomes 3 times of original (initial) in 2 hours. Then what is the time required when the number reaches to 100 times of its original? [8+7]

2. (a) Solve $y^{11} + 4y^1 - 12y = e^{2x} - 3\,Sin\,2\,x$
   (b) Solve $(D^3 - 1)y = 0$ [8+7]

3. (a)If u $=e^{xyz}$then find $\frac{\partial^3 u}{\partial x \partial y \partial z}$.
   (b) Find the Jacobian of transformation from 3D-Cartesian coordinates to spherical polar coordinates [8+7]

4. (a) Trace the curve $x = 2\cos^3 t, y = 3\sin^3 t$
   (b) Trace the curve $y^3 = x$. [8+7]

5. (a) Find the surface of the solid generated by the revolution of cardioid r=a (1-cosθ) about the initial line.
   (b) Find the surface of the solid generated by the revolution of the ellipse $x^2+4y^2 = 16$ about its Major axis . [8+7]

6. (a)Evaluate $\iint xydxdy$ over the positive Quadrant of the circle $x^2 + y^2 = a^2$.
   (b)Evaluate $\int\int\int_V (xy + yz + zx)\,dx$ dy dz where V is the region of space bound by $x = 0, x = 1, y = 0, y = 2, z = 0, z = 3$. [8+7]

7. (a) Prove that ∇×(∇×A) = ∇(∇.A) - ∇^2A
   (b) If f = x^{2}yz, g = xy − 3z^2 then find div(grad f × grad g) [8+7]

8. Verify divergence theorem for F = x^{2}i+y^{2}j+z^{2}k over the surface S of the solid cut off by the plane x+y+z =a in the first octant. [15]

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