Code No: R10102/R10

Set No. 1

I B.Tech I Semester Supplementary Examinations, Feb/Mar 2014
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 $(x^2 + y^2 - a^2)x\,dx + (x^2 - y^2 - b^2)y\,dy = 0$. [7+8]
   (b) If air is maintained at $20^0\,C$and the temperature of the body cools from $80^0\,C$ to $60^0\,C$ in 10 minutes, find the temperature of the body after 30 minutes.

2. (a) Solve $(D^2 + a^2)y = Sec\,ax$
   (b) Solve $(D^2 + 4)y = e^x + Sin\,2x$ [8+7]

3. (a) If V = $\log(x^2 + y^2) + x - 2y$ find $\frac{\partial V}{\partial x}, \frac{\partial V}{\partial y}, \frac{\partial^2 V}{\partial x^2}.\frac{\partial^2 V}{\partial y^2}$.
   (b) If U = $xe^{xy}$where $x^2 + y^2 + 2xy = 1$, find $\frac{\partial^2 U}{\partial x^2}$. [8+7]

4. (a) Trace the curve r = 2 + 3 sinθ.
   (b) Trace the curve $y^2(2a - x) = x^3$. [8+7]

5. (a) Find the surface of the solid generated by revolution of the lemniscate $r^2 = a^2\cos^2\theta$ about the initial line.
   (b) Show that the whole length of the curve $x^2(a^2 - x^2) = 8a^2y^2$ is $\pi a\sqrt{2}$. [8+7]

6. (a) Show that $\int_0^{4a}\int_{\frac{y^2}{4a}}^{y} \frac{x^2-y^2}{x^2+y^2}$ dx dy = $8a^2\left(\frac{\pi}{2} - \frac{5}{3}\right)$.
   (b) Evaluate $\iint_R y dxdy$ where R is the domain bounded by y-axis, the curve y=$x^2$and the line $x + y = 2$ in the first quadrants . [8+7]

7. (a) If V= e^{xyz}(i+j+k), find curl V.
   (b) Find the constants a and b so that the surface ax^2-byz = (a+2)x will be orthogonal to the surface $4x^2y + z^3 = 4$ at the point (1,-1,2) [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
   (i) $\int_v \nabla.f dV$and
   (ii) $\int_v \nabla \times f dV$ 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. 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 $e^y\left(1+\frac{dy}{dx}\right)=e^x$
   (b) Show that the family of curves$\frac{x^2}{a^2+\lambda}+\frac{y^2}{a^2+\lambda}=1$, where '$\lambda$' is a parameter is self orthogonal. [8+7]

2. (a) Solve $(D^2+9)y=2\,Cos^{\,2}x$. (b) Solve $\frac{d^2y}{dx^2}+4y=2e^xSin^2\,x$. [8+7]

3. (a) Calculate the approximate value of $\sqrt{10}$ to four decimal places using Taylor's theorem.
   (b) Find 3 positive numbers whose sum is 600 and whose product is maximum. [8+7]

4. (a) Trace the curve $y=x^2(x^2-4)$. (b)Trace the curve r = cosθ. [8+7]

5. (a) The figure bounded by a parabola and the tangents at the extremities of its latusrectum revolves about the axis of the parabola, Find the volume of the solid thus generated. [8+7]
   (b) The segment of the parabola y^2=4ax which is cutoff by the latus rectum revolves about the directrix.Find the volume of rotation of the annular region.

6. (a) Evaluate $\int\int(x+y)^2dx$ dy. over the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.
   (b) Transform the following to Cartesian form and hence evaluate $\int_0^\pi\int_0^a r^3\sin\theta drd\theta$. [8+7]

7. (a) Prove that ∇r = $\overline{r}$/r
   (b) Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point (2,-1,2). [8+7]

8. (a) Evaluate $\iint_S(yzi+zxj+xyk).dS$ where S is the surface of the sphere $x^2+y^2+z^2=a^2$ in the first octant.
   (b) Evaluate $\oint_c(x^2-2xy)dx+(x^2y+3)dy$ around the boundary of the region defined by y^2=8x and x=2. [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 $y(Sinx - y)\,dx = Cos\,x\;dy$
   (b) If the temperature of air is maintained at $20^0\,C$and the temperature of the body cools from $100^0\,C$to$80^0\,C$ in 10 minutes, find the temperature of the body after 20 minutes. [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) If r + s + t = x, s + t = xy, t = xyz, find $\frac{\partial(r,s,t)}{\partial(x,y,z)}$.
   (b) Find the extreme points of $f(x, y) = xy + \frac{8}{x} + \frac{8}{y}$. [8+7]
4. (a) Trace the curve $y = 5\cosh\left(\frac{x}{5}\right)$.
   (b) Trace the curve $y^2 = (4 - x)\,(3 - x^2)$ .. [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 $\int\int r dr d\theta$ over the region bounded by the cardioid r=a(1+cosθ) and out side the circle r=a .
   (b) Change the order of Integration & evaluate $\displaystyle\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{\mathrm{ax}}} dydx$ [8+7]
7. (a) Prove that (F$\times\nabla$)$\times\bar{r}$ = -2F
   (b) Determine the constant a so that the vector V = (x+3y)i+(y-z)j+(x+az)k is solenoidal. [8+7]
8. Apply Stokes theorem, to evaluate $\oint_c ydx + zdy + xdz$where C is the curve of intersection of the sphere x^2+ y^2+ z^2= a^2 and x + z = a. [15]

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Code No: R10102/R10 **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 $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$
   (b) Find the orthogonal trajectory of the family of curves $x^{2/3} + y^{2/3} = a^{2/3}$, where 'a' is a parameter [8+7]
2. (a) Solve $(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$
   (b) Solve $\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 15y = 0$ [8+7]
3. (a) If a = $\frac{yz}{x}$, b = $\frac{xz}{y}$, c = $\frac{xy}{z}$, find $\frac{\partial(x,y,z)}{\partial(a,b,c)}$.
   (b) Find the minimum value of $x^2 + y^2 + z^2$, give that $xyz = a^3$ [8+7]
4. (a) Trace the curve r = $\cos 4\theta$.
   (b) Trace the curve$y^2(1-x) = x^2(1+x)$.. [8+7]
5. Prove that the volume of the solid generated by the revolution about the $x - axis$ of the loop of the curve $x = t^2, y = t - \frac{1}{3}t^3$ is $\frac{3\pi}{4}$. [8+7]
6. (a) By changing the order of integration evaluate $\int_0^1 \int_0^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}} dydx$.
   (b) Evaluate $\int_0^a \int_{a-x}^{\sqrt{a^2-x^2}} y$ dx dy by using change of order of integration . [8+7]
7. (a) If V= e^{xyz}(i+j+k), find curl V.
   (b) Find the constants a and b so that the surface ax^2-byz = (a+2)x will be orthogonal to the surface 4x^2y +z^3 =4 at the point (1,-1,2) [8+7]
8. (a) Use divergence theorem to evaluate $\iint_S (x^3 i + y^3 j + z^3 k).Nds$, and S is the surface of the sphere x^2+y^2+z^2=r^2.
   (b) Using Green's theorem, Find the area bounded by the hypocycloid $x^{2/3}$+$y^{2/3}$= $a^{2/3}$, a>0. Given that the parametric equations are x =a $\cos^3\theta$, y =a $\sin^3\theta$. [8+7]

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