Code No: R10102/R10 **Set No. 1**

I B.Tech I Semester Supplementary Examinations, Jan/Feb 2015
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 $x\frac{dy}{dx} + y = x^3y^6$
   (b) Find the orthogonal trajectory of the family of curves $r^2 = a\ Cos2\theta$, where 'a' is a parameter [7+8]

2. (a) Define (i) Complementary Function (ii) Particular Integral
   (iii) Auxiliary Equation (iv) General Solution of a differential equation
   (b) Solve $y^{11} - 3y^1 + 2y = 0, y(0) = -1, y^1(0) = 0$ [8+7]

3. (a) Find Taylor's series expansion of f(x, y) = $x^2 + y^2$in powers of (x-1) and (y-2).
   (b) Expand f(x, y) = $e^y \cos x$ in powers of $\left(x - \frac{\pi}{4}\right)$ and (y-1). [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 area generated by rotating the arc of the catenary y = a cosh $\frac{x}{a}$ from x=o to a about the x-axis.
   (b) Find the volume of the solid generated by revolving about the x-axis of the loop of the curve $y^2 = x^2\frac{(a+x)}{a-x}$. [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 $\iint_R ydxdy$ 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) Prove that div curl f = 0
   (b) For what value of the constant a will the vector A = (axy-z^3)i+(a-2)x^2j +(1-a)xz^2k have its curl identically equal to zero. [8+7]

8. (a) Find $\int_c f.dr$ where f =xy i + yz j + zx k and the curve C is r = t i + t^2 j +t^3k, t varying from –1 to 1
   (b) Show that $\int_s(axi + byj + czk)\cdot N\,dS = \frac{4\pi}{3}$(a + b + c) where S is the surface of the surface of the sphere x^2 + y^2 +z^2= 1. [8+7]

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Code No: R10102/R10 **Set No. 2**

I B.Tech I Semester Supplementary Examinations, Jan/Feb 2015
MATHEMATICS-I
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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 $(xy^3 + y)\,dx + 2(y^2x^2 + x + y^4)\,dy = 0$
   (b) A bacterial culture, growing exponentially, increases from 100 to 400 grams in 12 hours. How much was present after 3 hours from the initial instant [8+7]

2. (a) Solve $(D^2 + 4D + 3)y = 2e^{-3x}$
   (b) Solve $(D^4 - 1)y = Cosx$ [8+7]

3. (a) If U = $e^{-2xy}\sin(x^2 - y^2)$ show that $\frac{\partial^2 U}{\partial x^2} + \frac{\partial^2 U}{\partial y^2} = 0$.
   (b) Find Taylor's series expansion of the f(x) = $x^{\frac{3}{2}}$in powers of (x-1). [8+7]

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

5. (a) A man walks along the curve 20y=3($4x^2$-20x+9) between the points, Where x=$\frac{1}{2}$and $x = \frac{9}{2}$ find the distance covered by the man?
   (b) Find the surface area of the solid generated by the revolution of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$ about the x-axis. [8+7]

6. (a) Change the order of integration in $\int_0^{4a}\int_{x^2/4a}^{\sqrt{2ax}} dy\,dx$.
   (b) By Changing the order of integration evaluate$\int_0^1\int_0^{\sqrt{1-x^2}} y^2\,dy\,dx$. [8+7]

7. (a) Prove that div curl f = 0
   (b) For what value of the constant a will the vector
   A = (axy-z^3)i+(a-2)x^2j +(1-a)xz^2k have its curl identically equal to zero. [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 $\int_s f.N ds$, 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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Code No: R10102/R10 **Set No. 3**

I B.Tech I Semester Supplementary Examinations, Jan/Feb 2015
MATHEMATICS-I
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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 $\frac{dy}{dx} = \frac{x^3+y^3}{xy^2}$
   (b) Find the time required for a sum of money to double itself at 5 % per annum compounded continuously? [8+7]

2. (a) Solve $y^{111} + 6y^{11} + 11y^1 + 6y = e^{2x}$
   (b) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x Sin\, x$ [8+7]

3. (a) Expand $f(x, y) = e^{x+y}$ in the neighborhood of (1,1).
   (b) If u $=\sqrt{xy}$then find all the first and second order partial derivatives of u. [8+7]

4. (a) Trace the curve $x^2(x^2 + y^2) = (x^2 - y^2)$.
   (b) Trace the curve $x = \sin\theta$, $y = \sin^2\theta\cos\theta$.. [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) 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) Find the directional derivative of $xyz^2 + xz$ at (1,1,1) in a direction of the normal to the surface $3x^2y + y = z$ at (0,1,1).
   (b) Show that the vector $(x^2\text{-}yz)\,i + (y^2\text{-}zx)j + (z^2\text{-}xy)k$ is irrotational and find its scalar potential. [8+7]

8. (a) Let C be the circle $x^2+y^2 = 4$, oriented counterclockwise. Use Green's Theorem to evaluate the following integral $\oint_c(\cos(y^2) - y^3)dx + x^3dy$
   (b) Compute $\oint_s(ax^2 + by^2 + cz^2)$ dS over the sphere $x^2 + y^2 + z^2 = 1$. [8+7]

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Code No: R10102/R10 **Set No. 4**

I B.Tech I Semester Supplementary Examinations, Jan/Feb 2015
MATHEMATICS-I
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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 $x\frac{dy}{dx} + y = x^3y^6$
   (b) Find the orthogonal trajectory of the family of curves $r^2 = a\ Cos2\theta$, where 'a' is a parameter [7+8]

2. (a) Solve $(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$
   (b) Solve $\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 15\,y = 0$ [8+7]

3. (a) Expand $f(x, y) = e^{x+y}$ in the neighborhood of (1,1).
   (b) If u $=\sqrt{xy}$then find all the first and second order partial derivatives of u. [8+7]

4. (a) Trace the curve$y = (x - 2)(x + 3)(x - 4)$ ..
   (b) Trace the curve r = $\frac{1}{2}$- sinθ. [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 $\int\int(x + y)^2dx$ 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 $\int_0^\pi \int_0^a r^3 \sin\theta dr d\theta$. [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 A = 0 [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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