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

I B.Tech I Semester Supplementary Examinations, Aug. 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 $(3x^2y^2 + x^2)\,dx + (2x^3y + y^2)\,dy = 0$
   (b) If the temperature of a body changes from $100^0\,C$ to $70^0\,C$ in 15 minutes, find when the temperature of the body will be $40^0\,C$, given that the temperature of the surroundings is $30^0\,C$ [7+8]

2. (a) Solve $\frac{d^2y}{dx^2} - 6\,\frac{dy}{dx} + 9\,y = e^x + e^{3x}$
   (b) Solve $(D^2 + 16)y = 0$ [8+7]

3. (a) Find the maximum of $\frac{15xyz}{4x+2y+4z}$ given that xyz = 8.
   (b) Find the maximum of x^3y^2z given that x + 3y + 4z = 10. [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 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 $\int\int r dr d\theta$ 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 $\int_0^{4a}\int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy dx$ [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) If s is surface of sphere with two units radius then show that $\int_S r.N\,ds = 32\pi$
   (b) Evaluate $\int_c f.dr$where f = $3x^2$ i + (2xz-y) j + z k along the straight line C from (0,0,0) to (2,1,3). [8+7]

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

I B.Tech I Semester Supplementary Examinations, Aug. 2015
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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 $(x^2y^3 + xy)\frac{dy}{dx} = 1$
   (b) Find the orthogonal trajectory of the family of curves $r = a\ (1 + Sin\,\theta)$, where 'a' is a parameter [8+7]

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

3. (a) If U $= f\left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$,P.T. $x^2\frac{\partial f}{\partial x} + y^2\frac{\partial f}{\partial y} + z^2\frac{\partial f}{\partial z} = 0$.
   (b) Expand $u = x^y$ in powers of (x-1) and (y-1) up to third degree terms. [8+7]

4. (a) Trace the curve r = a (1 + cos 2θ).
   (b) Trace the curve r = 3 + 2 cosθ. [8+7]

5. (a) Find the length of the arc of the semi-cubical parabola $ay^2 = x^3$ from the vertex to the ordinate x=5a .
   (b) Find the area of the surface of revolution generated by revolving one arc of the curve y=sinx about the x-axis . [8+7]

6. (a) Evaluate $\int\int\int_v dxdydz$ where V is the finite region of space formed by the planes x=0, y=0, $z = 0 and 2x + 3y + 4z = 12$.
   (b) Evaluate $\int\int_R y$ dxdy where R is the region bounded by the Parabolas $y^2 = 4x$ and $x^2 = 4y$. [8+7]

7. (a) Prove that $\nabla\times\{f(r)\bar{r}\} = 0$
   (b) Find a unit vector which is perpendicular to the surface of the paraboloid of revolution z= x^2+y^2 at the point (1,2,5). [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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Code No: R10102/R10 **Set No. 3**

I B.Tech I Semester Supplementary Examinations, Aug. 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 $\frac{dy}{dx} + y\,Sec\,x = \tan\,x$
   (b) Find the orthogonal trajectory of the family of curves $x^2 + y^2 = 2\,a\,x$, where 'a' is a parameter [8+7]

2. (a) Solve $y^{11} - 6y^1 + 25y = e^{2x} + x + Sin\,x$
   (b) Solve $y^{111} - 3y^{11} + 4y = 0, y(0) = 1, y^1(0) = -8, y^{11}(0) = -4$ [8+7]

3. (a) Show that U = $x^2e^{-y}\cosh z$, V = $x^2e^{-y}\sinh z$, w = $x^2+y^2+z^2-xy-yz-zx$are functionally dependent.
   (b) Determine whether the functions U =$\frac{x}{y-z}$, V =$\frac{y}{z-x}$, W=$\frac{z}{x-y}$ are dependent. If dependent find the relationship between them. [8+7]

4. (a) Trace the curve $x^2 + y^2 = xy$.
   (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) Evaluate$\int_0^1 \int_0^{1-z} \int_0^{1-y-z} xyz$ dxdyd$z$.
   (b) Evaluate $\int\int\int(x+y+z)dxdydz$ taken over the volume bounded by the planes $x = 0, x = 1; y = 0, y = 1; and$ z = 0, z = 1. [8+7]

7. (a) Find the unit normal vector to the level surfaces $x^2y + 2xz = 4$ at the point (2,-2,3)
   (b) Find the directional derivative of the function $xy^2 + yz^2 + zx^2$ along the tangent to the curve x = t, y = t^2, z = t at the point (1,1,1) [8+7]

8. Verify divergence theorem for $2x^2yi-y^2j+4xz^2k$ taken over the region of first octant of the cylinder $y^2+z^2=9$ and x=2. [15]

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

I B.Tech I Semester Supplementary Examinations, Aug. 2015
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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 $(x^2 + y^3 + 6x)\,dx + (y^2 x)\,dy = 0$
   (b) If the population of a country doubles in 50 years, in how many years will it triple, assuming that the rate of increase is proportional to the number of inhabitants? [8+7]

2. (a) Solve $\frac{d^2y}{dx^2} + y = 0$ *given that* $y(0) = 2,\ y\left(\frac{\pi}{2}\right) = -2$
   (b) Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 5e^{2x}$ [8+7]

3. (a) If x = $e^r \cos\theta$, y = $e^r \tan\theta$, show that $J\left(\frac{x,y}{r,\theta}\right) J\left(\frac{r,\theta}{x,y}\right) = 1$.
   (b) Find Taylor's series expansion of the f(x,y) = sin2x about x = $\frac{\pi}{4}$. [8+7]

4. (a) Trace the curve $r = 4\theta$.
   (b) Trace the curve r = $\frac{1}{4} + 2\sin\theta$. [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) Evaluate $\int\int (x+y)^2 dx$ 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$\nabla.\left\{r\nabla\left(\frac{1}{r^3}\right)\right\} = \frac{3}{r^4}$.
   (b) Find the directional derivative of Φ(x,y,z) = $x^2yz+4xz^2$at the point P = (1,-2,-1) in the directional of the normal to the surface f(x,y,z) = xlogz-y^2 at (-1,2,1). [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$\int_s f.N ds$ where S is the surface of the plane 2x + y + 2z = 6 in the first octant. [8+7]

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