Code : 9ABS104 **1**

B.TECH. I Year(R09) Regular Examinations, May/June 2010
MATHEMATICS-I
(Common to all branches)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
All questions carry equal marks
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1. (a) Solve :$(y^2 - 2xy)dx = (x^2 - 2xy)dy.$
   (b) Solve : $(x^2 - ay)dx = (ax - y^2)dy.$
2. (a) Solve :$(D^2 - 5D + 6)y = xe^{4x}$
   (b) Solve : $(D^2 + a^2)y = Secax$
3. (a) Verify Rolle's theorem for f(x) = e^{-x} sin x in [0, π].
   (b) Verify Rolle's theorem for f(x) = $\sqrt{4 - x^2}$ in [-2, 2].
4. (a) Find the radius of curvature at any point on the curve $y = c \cosh \frac{x}{c}$.
   (b) Find the radius of curvature of the curve $x^2y = a(x^2 + y^2)$ at (-2a, 2a).
5. (a) Evaluate $\int_0^1 \int_0^{X^2} e^{y/x} dy \ dx.$
   (b) Change the order of integration and evaluate $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dy \ dx.$
6. (a) Find the Laplace transform of i) e^{-3t} (2 cos 5t - 3 sin 5t) . ii) $e^{3t} \sin^2 t$
   (b) Find $L^{-1}\left\{\frac{s^2}{(s^2+4)(s^2+9)}\right\}$ Using Convolution theorem.
7. (a) Using Laplace Transform, show that $\int_0^{\infty} t^2 e^{-4t} \sin 2t dt = \frac{11}{500}$.
   (b) Solve the D.E $y^{II} + n^2y = a\sin(nt + 2), y(0) = 0, y^1(0) = 0$ Using Laplace transform.
8. (a) If $r = \overline{x_i} + \overline{y_j} + \overline{z_k}$, show that $\nabla r^n = nr^{n-2}\overline{r}$
   (b) Find the works done in moving in a particle in the force field $\overline{F} = (3x^2)i + (2zx - y)j + zk,$, along i) the straight line form (0,0,0) to (2,1,3) ii) the curve defined by $x^2 = 4y$, $3x^3 = 8z$ from x= 0 to x= 2.

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Code : 9ABS104 **2**

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MATHEMATICS-I
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Answer any FIVE questions
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1. (a) Solve : $\left(1+e^{x/y}\right)dx+\left(1-\frac{x}{y}\right)e^{\frac{x}{y}}dy=0$
   (b) Solve : x dx + y dy = $\frac{xdy-ydx}{x^2+y^2}$.
2. (a) Solve : $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+3y=e^{2x}$
   (b) Solve : $(D^3-5D^2+8D-4)y=e^{2x}$
3. (a) Verify Rolle's theorem for f(x) = $(x-a)^m(x-b)^n in[a,b]$.
   (b) Verify Rolle's theorem for f(x) = $\log\frac{x^2+ab}{(a+b)x}$ in [a, b].
4. (a) Trace the curve y = x^3.
   (b) Trace the curve y = (x - 1) (x - 2) (x - 3).
5. (a) Evaluate $\iint_R y\ \ dx\ \ dy$, ,where R is the region bounded by the parabola $y^2=4x$ and $x^2=4y$
   (b) Evaluate the integral by changing the order of integration $\int_0^1\int_0^{\sqrt{(1-x^2)}}y^2\ \ dx\ \ dy.$
6. (a) Find the Laplace transform of f(t) defined as $f(t)=t/\tau$ when $o<t<\tau$
   $=1when\ t>\tau.$
   (b) Find $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$ Using Convolution theorem.
7. (a) Using Laplace transform, evaluate $\int_0^\infty\frac{(\cos at-\cos bt)}{t}dt.$
   (b) Solve the D.E. $y^{11}+2y^1+5y=e^{-t}\sin t, y(0)=0, y^1(0)=1.$ Using L.T.
8. (a) If $\overline{A}$ is a constant vector and $\overline{R}=\overline{x_i}+\overline{y_j}+\overline{z_k}$, prove that $\nabla X\left(\frac{\overline{A}X\overline{r}}{r^n}\right)=\frac{(2-n)\overline{A}}{r^n}+\frac{n(\overline{r}.\overline{A})\overline{r}}{r^{n+2}}.$
   (b) If $\overline{F}=(5xy-6x^2)i+(2y-4x)j$, Evaluate $\int_c\overline{F}.d\overline{R}$,where C is the curve in the xy-plane $y=x^3from(1,1)to(2,8).$

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Code : 9ABS104 **3**

B.TECH. I Year(R09) Regular Examinations, May/June 2010
MATHEMATICS-I
(Common to all branches)

Time: 3 hours **Max Marks: 70**

Answer any FIVE questions
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1. (a) Solve :$\frac{dy}{dx} + \frac{y\cos x+\sin y+y}{\sin x+x\cos y+x} = 0$
   (b) Solve :$\frac{y(xy+e^x)dx-e^x dy}{y^2} = 0$
2. (a) Solve : $(D^2 - 3D + 2)y = cosh\ x$
   (b) Solve : $(D + 2)(D - 1)^2 4 = e^{-2x} + 2sinh\ x$
3. (a) Verify Rolle's theorem for f(x) = x(x + 3) $e^{-x/2}$ in [-3, 0].
   (b) Verify Rolle's theorem for f(x) = $e^x sinx in [0, \pi]$.
4. (a) Trace the curve r = a(1 + cos θ).
   (b) Trace the curve r = a + b cos θ, a > b.
5. (a) Evaluate $\int_A xy\ \ dx\ \ dy$,where A is the domain bounded by x-axis, ordinate x=2a and the curve $x^2 = 4ay$.
   (b) Evaluate the integral by changing the order of integration $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy\ \ dx$.
6. (a) Find the Laplace Transform of $\left\{\left(\sqrt{t} + \frac{1}{\sqrt{t}}\right)^3\right\}$
   (b) Find $L^{-1}\left\{\frac{s}{s^4+4a^4}\right\}$.
7. (a) Using Laplace transform, evaluate$\int_0^\infty \frac{(e^{-t}-e^{-2t})}{t} dt$.
   (b) Solve the D.E $(D^2 + n^2)y = a\sin(nt + a), given\ \ y = Dy = 0 at\ \ t = 0$ Using Laplace transform.
8. (a) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point P (1, 2, 3) in the direction of the line PQ where Q is the point (5, 0, 4).
   (b) Evaluate the Line integral $\int_c [(x^2 + xy)dx + (x^2 + y^2)dy]$ where c is the square formed by the lines x= ± 1 and y = ± 1.

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Code : 9ABS104 **4**

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Answer any FIVE questions
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1. (a) Solve : (i) $\frac{ydx-xdy}{x^2} + e^{y^2}dy^2 = 0$
   (ii) $\frac{ydx-xdy}{xy} + 2x\sin x^2 dx = 0$
   (b) Solve: (i) ydx + xdy + xy (ydx - xdy) = 0
   (ii) xdy + 2ydx = 2y^{2}xdy
2. (a) Solve : $(D^2 + 5D + 6)y = e^x$
   (b) Solve : $(D^2 + 6D + 9)y = 2e^{-3x}$
3. (a) Verify Rolle's theorem for f(x) = x^2 - 5x + 6 in [2, 3].
   (b) Examine if Rolle's theorem is applicable for the function f(x) = tan x in [0,π].
4. (a) Trace the curve x = a(θ + sin θ), y = a(1 + cos θ).
   (b) Trace the curve x = a(θ - sin θ), y = a(1 - cos θ).
5. (a) Evaluate $\int_0^3 \int_1^2 xy(1 + x + y)dy\ \ dx$
   (b) Evaluate the integral by changing the order of integration $\int_0^3 \int_1^{\sqrt{4-y}} (x + y)dx\ \ dy$.
6. (a) Find the Laplace transform of i) $\left\{\frac{\sin 3t.\cos t}{t}\right\}$.
   ii) $\left\{t^2 \sin 2t\right\}$.
   (b) Find $L^{-1}\left\{\frac{s+1}{(s^2+2^s+2)^2}\right\}$.
7. (a) Using Laplace transform, evaluate $\int_0^\infty \frac{(\cos 5t-\cos 3t)}{t}dt$.
   (b) Solve the D.E. $\frac{d^2x}{dt^2} + 9x = \sin t$ Using L.T. given that $x(0) = 1, x\left(\frac{\pi}{2}\right) = 1$.
8. (a) 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).
   (b) Apply Greens theorem to evaluate $\int_c [(2x^2 - y^2)dx + (x^2 + y^2)dy]$, where C is the boundary of the area enclosed by the x-axis and upper half of the circle $x^2 + y^2 = a^2$.

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