

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

1. (a) Solve : $\left(1 + e^{\frac{x}{y}}\right) dx + \left(1 - \frac{x}{y}\right) e^{\frac{x}{y}} dy = 0$
 (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 $0 < t < \tau$
 $= 1$ when $t > \tau$.
 (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 A is a constant vector and $R = xi + yj + zk$, prove that $\nabla X \left(\frac{\bar{A} \cdot \bar{R}}{r^n} \right) = \frac{(2-n)\bar{A}}{r^n} + \frac{n(\bar{r} \cdot \bar{A})\bar{r}}{r^{n+2}}$.
 (b) If $\bar{F} = (5xy - 6x^2)i + (2y - 4x)j$, Evaluate $\int_C \bar{F} \cdot d\bar{R}$, where C is the curve in the xy-plane $y = x^3$ from $(1, 1)$ to $(2, 8)$.
