

Code: R7 100102

B.Tech I Year (R07) Supplementary Examinations, May 2012

MATHEMATICS - I

(Common to all branches)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

- 1 (a) Solve $y dx - x dy + (1 + x^2)dx + x^2 \sin y dy = 0$.
(b) Solve $y(2xy + e^x)dx = e^x dy$.
- 2 (a) Solve: $(D^2 - 3D + 4)y = 0$.
(b) Solve: $y'' - y' - 2y = 3e^{2x}$ given that $y(0) = 0$, $y'(0) = -2$.
- 3 (a) Verify Rolle's theorem for $f(x) = \frac{x^2 - x - 6}{x - 1}$ in the interval $(-2, 3)$.
(b) Verify if $u = x + 2y + z$, $V = x - 2y + 3z$, $W = 2xy - xz + 4yz - 2z^2$ are functionally related and if so, find the relation between them.
- 4 (a) Find the radius of curvature at the point $(\frac{3a}{2}, \frac{3a}{2})$ of the curve $x^3 + y^3 = 3axy$.
(b) Trace the curve: $y^2(a + x) = x^2(3a - x)$.
- 5 (a) Evaluate $\iint_R xy dx dy$ where R is the region bounded by the line $x + 2y = 2$, lying in the first quadrant.
(b) By changing the order of integration evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dy dx$.
- 6 (a) Test for convergence of the series:
$$\sum_{n=1}^{\infty} [\sqrt{n^4 + 1} - \sqrt{n^4 - 1}]$$

(b) Test the convergence of the series:
$$\sum_{n=1}^{\infty} \frac{x^{2n}}{(n+1)\sqrt{n}}$$
- 7 (a) Find the constants a,b,c so that $\vec{F} = (x + 2y + az)\vec{i} + (bx - 3y - z)\vec{j} + (4x + cy + 2z)\vec{k}$ is irrotational.
(b) If $\vec{F} = (2y + 3)\vec{i} + xz\vec{j} + (yz - x)\vec{k}$ evaluate $\int_C \vec{F} \cdot d\vec{r}$ along the line joining the origin and the point (2,1,1).
- 8 (a) Find the Laplace transform of the function: (i) $e^{at} \cosh bt$. (ii) $t^2 \cdot e^{-2t}$.
(b) Find the inverse transform of the following functions:
(i) $\frac{1}{s^2(s^2 + a^2)}$. (ii) $\frac{1}{s(s+1)(s+2)}$.
