

R09

Code: 9ABS104

B.Tech I Year (R09) Supplementary Examinations December/January 2015/2016

MATHEMATICS - I

(Common to all branches)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Solve : $y^2 dx + (x^2 - xy - y^2) dy = 0$.
(b) Solve : $x^2 y dx - (x^3 + y^3) dy = 0$.
- 2 (a) Solve the differential equation: $(2x-1)^3 \frac{d^3 y}{dx^3} + (2x-1) \frac{dy}{dx} - 2y = x$
(b) Solve the differential equation: $(1+x)^2 \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} + y = \sin 2[\log(1+x)]$.
- 3 (a) Find the minimum value of $u = x^2 + y^2 + z^2$ when $x + y + z = 3a$.
(b) Find the minimum value of $u = x^4 + y^4 + z^4$ subject to $xyz = a^3$.
- 4 (a) Trace the curve $r = a \cos 3\theta$.
(b) Trace the curve $r^2 = a^2 \cos 2\theta$.
- 5 (a) Evaluate $\iint xy \, dx \, dy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$.
(b) Evaluate the integral by changing the order of integration $\int_0^\infty \int_0^x x e^{-x^2/y} \, dy \, dx$.
- 6 (a) Find the Laplace transform of $f(t) = \begin{cases} t & \text{when } 0 < t < \pi \\ \pi - t & \text{when } \pi < t < 2\pi \end{cases}$ with period 2π .
(b) Use Heaviside's expansion formula to find $L^{-1} \left\{ \frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6} \right\}$.
- 7 (a) Solve the D.E. $y'' + 6y' + 9y = 6t^2 e^{-3t}$, $y(0) = 0$, $y'(0) = 0$. Using Laplace transform.
(b) Using Laplace transform, Evaluate $\int_0^\infty e^{-t} \frac{(2 \sin t - 3 \sinh t)}{t} \, dt$.
- 8 (a) Evaluate $\text{div}(\mathbf{r}^n \bar{\mathbf{R}})$, where $\bar{\mathbf{R}} = xi + yj + zk$, $r = |\bar{\mathbf{r}}|$.
(b) Apply Greens theorem to evaluate $\int_C e^{-x} (\sin y \, dx + \cos y \, dy)$, where C is the rectangle with vertices $(0,0)$, $(\pi,0)$, $(\pi, \frac{\pi}{2})$ and $(0, \frac{\pi}{2})$.
