Code: 9ABS104

R9

B.Tech I Year (R09) Supplementary Examinations, November/December 2012

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: $\left(x^2-1\right)\frac{dy}{dx}+2xy=1.$

(b) Solve : $x\frac{dy}{dx}+y=\log x.$

2 (a) Solve by method of variation of parameters: $(D^2 + a^2)\ y = \sec ax.$

(b) Solve by method of variation of parameters: $y'' + 4y = \tan 2x.$

3 (a) Verify Rolle's theorem for $f(x) = x(x + 3)\ e^{-x/2}$ in [-3, 0].

(b) Verify Rolle's theorem for $f(x) = e^x \sin x$ in $[0,\pi]$.

4 (a) Prove that the volume of revolution of $r^2 = a^2 \cos 2\theta$ about the initial line is $\frac{\pi a^3}{6\sqrt{2}}\left[3\log\left(\sqrt{2}+1\right)-\sqrt{2}\right].$

(b) Determine the volume of the solid generated by revolving the lemicon $r = a + b \cos\theta$ $(a > b)$ about the initial line.

5 (a) Evaluate $\int_0^{\infty}\int_0^{\pi/2} e^{-r^2}\, r\, d\theta\, dr.$

(b) Change the order of integration in $\int_0^1\int_x^{\sqrt{2-x^2}} \frac{x\, dy\, dx}{\sqrt{x^2+y^2}}$ and evaluate.

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6 (a) Find the Laplace transform of f (t) = $\begin{cases} t & , 0 < t < 3 \\ 3 & , \quad t > 3 \end{cases}$

(b) Find $L^{-1}\left\{\frac{se^{-s/2} + \pi e^{-s}}{s^2 + \pi^2}\right\}$.

7 (a) Using Laplace transform, evaluate $\int_0^\infty \frac{(\cos 6t - \cos 4t)}{t} dt$.

(b) Solve the D.E. $\frac{d^2x}{dt^2} + 9x = \cos 2t$ Using L.T. given that $x(0) = 1,\ x\left(\frac{\pi}{2}\right) = -1$.

8 (a) Find the values of constants $\lambda\ and\ \mu$ so that the surfaces $\lambda x^2 - \mu yz = (\lambda + 2)x\ \ and\ 4x^2y + z^3 = 4$ may intersect orthogonally at the point (1, -1, 2).

(b) Evaluate $\iint_S \bar{F} \cdot \bar{n}\, dS$, where $\bar{F}$ = (18 z) **i** – 12 **j** + 3 y**k** and S is the surface of the plane 2x + 3y + 6z = 12 in the first octant.

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