**R13**

Code: 13A54101

B.Tech I Year (R13) Supplementary Examinations December/January 2014/2015

**MATHEMATICS – I**

(Common to all branches)

Time: 3 hours Max. Marks: 70

**PART – A**

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Solve $(D^3 + 1)y = 0$.

(b) Solve $\frac{dy}{dx} = (x + y + 2)^2 = 0$.

(c) Expand $e^{x+y}$ in a neighborhood of $(1, 1)$.

(d) Find the envelop of the family of curves $y = mx + m^4$ for different values of '$m$'.

(e) Find the asymptotes of $y^3 - x^2y + 2y^2 + 4y + x$.

(f) Find the quadrature of the rectangular hyperbola $y = k^2/x$ from $x = a$ to $x = b$.

(g) $\mathcal{L}\{e^{at}\cosh bt\} =$

(h) $\mathcal{L}^{-1}\left\{\frac{e^{-3s}}{s^3}\right\} =$

(i) Prove that $\bar{a}.\left(\nabla\frac{1}{r}\right) = -\frac{\bar{a}\,.\,\bar{r}}{r^3}$, $\bar{a}$ is a constant vector.

(j) State Green's theorem.

**PART – B**

(Answer all five units, 5 X 10 = 50 Marks)

**UNIT - I**

2 The deflection of a strut of length $\ell$ with one end built - in and the other end subjected to the end thrust $P$, satisfies $\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}(\ell - x)$. Find the deflection $y$ of the strut at a distance $x$ from the built - in end.

OR

3 Solve $(D^2 - 4D)y = e^x + \sin 3x \cos 2x$.

**UNIT - II**

4 Verify Maclaurin's theorem for $f(x) = (1 - x)^{5/2}$ with Lagrange form of remainder up to 3 terms with $x = 1$.

OR

5 Find the radius of curvature at any point $P(at^2, 2at)$ on the parabola $y^2 = 4ax$. Show that it is $2\frac{(SP)^{3/2}}{\sqrt{a}}$. Where $S$ is the focus of the parabola?

**UNIT - III**

6 Find the volume of the solid generated by revolution of the loop of the curve $y^2(a - x) = x^2(a + x)$ about the $x - $axis.

OR

7 Evaluate the integral $\int_{y=0}^{1}\int_{x=y}^{a}\frac{x\,dx\,dy}{x^2+y^2}$.

**UNIT - IV**

8 Find the Laplace transform for $f(t) = \left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)^3$.

OR

9 The triangular wave function defined by $f(t) = \begin{cases} t, & 0 < t < a \\ 2a - t, & a < t < 2a \end{cases}$ and $f(t + 2a) = f(t)$. Find Laplace transform of $f(t)$.

**UNIT - V**

10 Find the directional derivative of $\emptyset(x, y, z) = xy + yz + zx$ in the direction of $-2\bar{i} + \bar{j} + 2\,\bar{k}$ at the point $(1,2,0)$.

OR

11 If $\bar{F} = 2xz\bar{i} - x\bar{j} + y^2\bar{k}$ evaluate $\iiint_V \bar{F}\,dv$ where $V$ is the region bounded by the surface $x = 0, y = 0, x = 2, y = 6, z = x^2, z = 4$.

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