Code: 13A54101 **R13**

B.Tech I Year (R13) Supplementary Examinations December/January 2015/2016

MATHEMATICS – I

(Common to all branches)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) Eliminate C from the equation $y = Ce^{\sin^{-1}x}$

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

(c) Find C.F $y''' - 7y'' + 14y' - 8y = 0$.

(d) Find Particular Integral of $(D^2 + 5D + 6)y = e^x$.

(e) If $x = r\cos\theta, \quad y = r\sin\theta$ find $\frac{\partial(x,y)}{\partial(r,\theta)}$.

(f) Explain Stationary points and Stationary Values.

(g) Find the Laplace Transform of $e^{-3t}(2cos5t - 3sin5t)$.

(h) Find $L^{-1}\left[log\ \frac{1+s}{s^2}\right]$ = ----

(i) Find Div $\overline{f}$ where $\overline{f} = grad(x^3 + y^3 + z^3 - 3xyz)$.

(j) State Green's theorem in xy-plane.

PART – B

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

UNIT - I

2 (a) *Solve* $(1+y^2) + (x - e^{\tan^{-1}y})\frac{dy}{dx} = 0$

(b) A body kept in air with temperature 25^{0}C cools from 140^{0}C to 80^{0}C in 20 min. Find when the body cools down to 35^{0}C.

OR

3 (a) Solve $(D^2 + a^2)y = tanax$ by method of variation of parameter.

(b) Solve $y'' + y = e^{-x} + x^3 + e^x \sin x$

UNIT - II

4 (a) Verify whether the following functions are functionally dependent, if so, find the relation between them u= $\frac{x+y}{1-xy}$, v=Tan^{-1}x+Tan^{-1}y.

(b) Examine the following function for extreme values $f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$

OR

5 A rectangular box open at the top is to have volume of 32 cubic feet. Find the dimensions of the box requiring least material for its construction.

UNIT - III

6 Trace the curve $x^3 + y^3 = 3axy$

OR

7 Find the length of arc of the parabola $y^2 = 4ax$ cut off by the line 3y = 8x.

Contd. in page 2

Code: 13A54101 **R13**

UNIT - IV

8 (a) Find the Laplace Transform of the following:

(i) $\frac{sin2t}{t}$. (ii) $\frac{e^{-4t}\,sin3t}{t}$.

(b) Find the inverse Laplace Transform of $\frac{s}{(s^2+a^2)^2}$ using Convolution theorem.

OR

9 Solve by Laplace Transform method. $y'' - 3y' + 2y = 4, where\ y(0) = 2;\ y'(0) = 3.$

UNIT - V

10 Verify Stoke's theorem for $F = (x^2 + y^2)i - 2xyj$ taken around the rectangle bounded by the lines $x = \pm a,\ y = 0,\ y = b$.

OR

11 (a) Prove that $div.(grad\, r^m) = m(m+1)r^{m-2}$.

(b) Find the directional derivative of $f = xy + yz + zx$ in the direction of vector $i + 2j + 2k$ at the point (1, 2, 0).

*****