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

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

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

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

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

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

(f)   Explain Stationary points and Stationary Values.

(g)   Find the Laplace Transform of $e^{-3t}(2\cos 5t - 3\sin 5t).$

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

(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)

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

(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 $(D^2 + a^2)y = \tan ax$ by method of variation of parameter.

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

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│ **UNIT - II** │
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4   (a)   Verify whether the following functions are functionally dependent, if so, find the relation between them

u=$\dfrac{x + y}{1 - xy}$, 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.

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│ **UNIT - III** │
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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.

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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).

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