H.T.No. | | | | | | | | | | |

Code No: MA1501 **GEC-R14**

I B. Tech I Semester Regular/Supplementary Examinations, December 2016

MATHEMATICS-I

(Common to All Branches)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. Find the integrating factor of the linear differential equation $\frac{dy}{dx} + \frac{y}{x} = \text{Tan}\,2x$.
2. Find the particular integral of $(D + 1)^2 y = e^{-x}$.
3. If $u = x^2 - y^2$, $v = 2xy$, and $x = r\cos\theta$, $y = r\sin\theta$ find $\frac{\partial(u,v)}{\partial(r,\theta)}$.
4. Evaluate the integral $\int_1^2\int_1^3 xy^2\,dx\,dy$.
5. Find curl $\bar{F}$, where $\bar{F} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$
6. Write the statement of Stoke's theorem.

PART- B

4 × 12 = 48M

1. a) Solve $\left(1 + y^2\right) dx = \left(\tan^{-1} y - x\right) dy.$ (6M)

   b) The number N of bacteria in the culture grows at a rate proportional to N. The value of N was initially 50 and increased to 150 in one hour, what will be the value of N after one and half hour. (6M)

2. a) Solve $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{-2x}$. (6M)

   b) Solve $\left(D^2 + 2D + 3\right)y = \sin x$ (6M)

3. a) If $u = x\sqrt{\left(1 - y^2\right)} + y\sqrt{\left(1 - x^2\right)}$, $v = \sin^{-1} x + \sin^{-1} y$, show that u, v are functionally related. (6M)

   b) Find the volume of the greatest rectangular parallelopiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$. (6M)

4. a) Trace the curve $y^2(2a-x)=x^3$. (6M)

   b) Find the volume of the solid bounded by the planes $x=0,\ y=0,$ $x+y+z=1$ and $z=0$. (6M)

5. a) Show that $\nabla^2 f(r)=f''(r)+\frac{2}{r}f'(r)$. (6M)

   b) Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point (2,-1, 2). (6M)

6. a) Find the work done in moving a particle in the force field $\overline{F}=3x^2\overline{i}+(2xz-y)\overline{j}+z\overline{k}$ along the straight line from (0,0,0) to (2,1,3). (6M)

   b) Apply Green's theorem for $\int_c \left[(xy+y^2)dx+x^2dy\right]$, where c is bounded by $y=x$ and $y=x^2$. (6M)

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