Code No: R13102 **R13** SET - 1

I B. Tech I Semester Supplementary Examinations, Nov/Dec - 2017
MATHEMATICS-I
Time: 3 hours (Comm. to All Branches) Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1. a) Solve $ydx - xdy = a(x^2 + y^2)dx$. (4M)
   b) Find the Particulat integral of $(D^2 + 4D + 5)y = x^2$. (4M)
   c) Find the Laplace transform of $u(t-2)e^t$. (3M)
   d) Determine whether the following functions $u = e^x \sin y, v = e^x \cos y$ are functionally dependent or not. (3M)
   e) Form the partial differential equation by eliminating arbitrary constants a and b from $z = (x-a)^2 + (y-b)^2 + 1$. (4M)
   f) Write the one dimensional wave equation with necessary conditions. (4M)

PART -B

2. a) Solve $(x + 2y^3)\frac{dy}{dx} = y$. (8M)
   b) If 30% of a radioactive substance vanished in 10 days. How long will it take for 90% of it to vanish? (8M)

3. a) Solve $(D^2 + 1)y = e^{-x} + e^x Cosx$. (8M)
   b) In an L-C-R circuit, the charge q on a plate of a condenser is given by (8M)
   $$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = ESinpt$$
   The circuit is tuned to resonance so that q^2=1/LC. If initially q=0, i=0 and $CR^2 < 4L$. Find charge q.

4. a) Evaluate $\int_0^\infty e^{-2t}\frac{1-\cos t}{t}dt$ (8M)
   b) Solve $(D^2 - 4D - 12)y = e^{3t}$ given that y(0) = 1 and $y^1(0)$ = – 2 using Laplace transforms. (8M)
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5. a) If $u = \frac{yz}{x}$, $v = \frac{xz}{y}$, $w = \frac{xy}{z}$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ (8M)

   b) Find the minimum value of $x^2 + y^2 + z^2$ given x + y + z = 3a. (8M)

6. a) Form the partial differential equation by eliminating the arbitrary function f from $xyz = f(x^2 + y^2 + z^2)$. (8M)

   b) Solve $y^2 p - xyq = x(z - 2y)$ (8M)

7. Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions u(0, y) = 0, u(10, y) = 0, u(x, ∞) = 0 and $u(x, 0) = \begin{cases} 20x & for\ 0 \le x \le 5 \\ 20(10 - x) & for\ 5 \le x \le 10 \end{cases}$ where $y \ge 0$ and $0 \le x \le 10$. (16M)