I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018
MATHEMATICS-I

Time: 3 hours Max. Marks: 70

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

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PART –A

1. a) State Newton's law of cooling. (2M)
   b) Test whether the functions $e^x \cos x$ and $e^x \sin x$ are linearly independent or not. (2M)
   c) Write the Laplace transform of y'', given that $y(0)=1$ and $y'(0)=1$. (2M)
   d) Verify whether $u = 2x - y, v = x - 2y$ are functionally dependent. (2M)
   e) Find the general solution of $3p^2 = q$. (2M)
   f) Find the general solution of $(D^2 - 4DD' + 4D'^2) = 0$. (2M)
   g) Find Laplace transform of $t \cos at$. (2M)

PART -B

2. a) Solve $3e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$. (7M)
   b) Find the equation of the system of orthogonal trajectories of the parabolas $r = \dfrac{2a}{1 + \cos\theta}$, where a is the parameter. (7M)

3. a) $Solve\ (D^2 - 3D + 2)y = Cos3x.$ (7M)
   b) $Solve\ (D^2 - 5D + 6)y = e^x Sinx.$ (7M)

4. a) Find $L\,[t^3 e^{2t} \sin t]$. (7M)
   b) $y'' - 3y' + 2y = 4t + e^{3t}$ when y (0) = 1 and $y'(0) = -1$. (7M)

5. a) If x + y + z = u, y + z = uv, z = uvw, then evaluate $\dfrac{\partial(x, y, z)}{\partial(u, v, w)}$. (7M)
   b) Find the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid $\dfrac{x^2}{4} + \dfrac{y^2}{9} + \dfrac{z^2}{25} = 1$. (7M)

6. a) Form a partial differential equation by eliminating the arbitrary functions f and g from $z = xf(ax + by) + g(ax + by)$. (7M)
   b) Solve $z^2(p^2 + q^2) = x^2 + y^2$. (7M)
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7. a) Solve $(4D^2 + 12DD' + 9D'^2)z = e^{3x-2y}$. (7M)

   b) Classify the nature of the partial differential equation $x^2 \frac{\partial^2 u}{\partial x^2} + (1 - y^2)\frac{\partial^2 u}{\partial y^2} = 0,\ -\infty < x < \infty,\ -1 < y < 1.$ (7M)

Code No: R161102 **R16** SET - 2

I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018
MATHEMATICS-I

Time: 3 hours Max. Marks: 70

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2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Write the differential equation for L-R circuit, explain the terms involved in it and write the solution of the differential equation. (2M)
   b) Test whether the functions e^x and xe^x are linearly independent or not. (2M)
   c) Write the second shifting theorem of Laplace transforms. (2M)
   d) If $u = \frac{y}{x}, v = xy,$ then find $J\left(\frac{u,v}{x,y}\right)$. (2M)
   e) Find the general solution of $p^2+q^2=1$. (2M)
   f) Find the general solution of $(D^2 + DD' - 2D'^2) = 0$. (2M)
   g) Find L [sin 2t sin 3t]. (2M)

PART -B

2. a) Solve $\frac{dy}{dx} + \frac{y}{x}\log y = \frac{y}{x^2}(\log y)^2$. (7M)
   b) Find the orthogonal trajectories of the following family of curves: $r^n = a^n \sin n\theta$. (7M)
3. a) Solve $(D^2 - p^2)y = \text{Sinh } px$. (7M)
   b) Solve $(D^2 - 6D + 13)y = 8e^{3x}\text{Sin}2x$. (7M)
4. a) Find $L[(t+3)^3 e^{2t}]$ (7M)
   b) Solve $(D^2 + 2D + 1)y = 3te^{-t}$ given that $y(0) = 4, y'(0) = 2$. (7M)
5. a) Prove that u = $\frac{x^2 - y^2}{x^2 + y^2}$, v = $\frac{2xy}{x^2 + y^2}$ are functionally dependent and find the relation between them. (7M)
   b) Find the maximum and minimum values x + y + z subject to $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=1$. (7M)
6. a) Form a partial differential equation by eliminating the arbitrary function $z = f(x^2 + y^2 + z^2)$. (7M)
   b) Solve $x^2(z - y)p + y^2(x - z)q = z^2(y - x)$. (7M)
7. a) Solve $(D^3 + D^2D' - DD' - D'^3)z = 3\sin(x + y)$. (7M)
   b) Classify the nature of the partial differential equation $\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x\,\partial y} + (x^2 + y^2)\frac{\partial^2 u}{\partial y^2} = \sin(x + y)$. (7M)
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Code No: R161102 **R16** SET - 3

I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018
MATHEMATICS-I

Time: 3 hours Max. Marks: 70

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

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PART –A

1. a) Write the differential equation for C-R circuit, explain the terms involved in it and write the solution of the differential equation. (2M)
   b) Test whether the functions $\sin x$ and $x\sin x$ are linearly independent or not. (2M)
   c) State convolution theorem in Laplace transforms. (2M)
   d) Find the stationary points of f(x, y) = xy + (x – y). (2M)
   e) Find the general solution of $pq=1$. (2M)
   f) Find the general solution of $(D^2+7DD'+12D'^2)=0$. (2M)
   g) Find Laplace transform of t^2e^{-2t}. (2M)

PART -B

2. a) Solve $(x+2y^3)\frac{dy}{dx}=y$. (7M)
   b) Find the orthogonal trajectories of the family $r=2a(\cos\theta+\sin\theta)$ (7M)
3. a) $Solve\ (D^2-4D+3)y=Sin3xCos2x.$ (7M)
   b) $Solve\ (D^2-2D+1)y=xe^xSin\mathrm{x}$ (7M)
4. a) Find $L\,[t^2\sin at]$. (7M)
   b) Solve $(D^2+6D+9)y=\sin t$ given that $y(0)=1, y'(0)=0$. (7M)
5. a) If u = $\frac{yz}{x}$, v = $\frac{xz}{y}$, w = $\frac{xy}{z}$ find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$. (7M)
   b) Find the stationary points of u(x, y) = sin x sin y sin (x + y) where $0<x<\pi, 0<y<\pi$ and find the maximum u. (7M)
6. a) Form a partial differential equation by eliminating the arbitrary function f from $xyz=f(x^2+y^2+z^2)$. (7M)
   b) Solve $(x^2-yz)p+(y^2-zx)q=z^2-xy$. (7M)
7. a) Solve $(D^3-4D^2D'+4DD'^2)z=6\sin(3x+6y)$. (7M)
   b) Classify the nature of the partial differential equation $\frac{\partial^2u}{\partial x^2}+2\frac{\partial^2u}{\partial x\,\partial y}+\frac{\partial^2u}{\partial y^2}=0$. (7M)
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Code No: R161102 **R16** SET - 4

I B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018
MATHEMATICS-I

Time: 3 hours Max. Marks: 70

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3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) State law of natural growth or decay and write the corresponding differential equations and their solutions. (2M)
   b) Test whether the functions e^{2x} and e^{5x} are linearly independent or not. (2M)
   c) Find the Laplace transform of Heaviside's unit function. (2M)
   d) Expand $e^x \cos y$ near $(1, \frac{\lambda}{4})$ (2M)
   e) Find the general solution of $p+q=1$. (2M)
   f) Find the general solution of $(D^2 - 4DD'+4D'^2) = 0$. (2M)
   g) If $L\left(\frac{\sin t}{t}\right) = \tan^{-1}\frac{1}{s}$, find $L\left(\frac{\sin at}{t}\right)$. (2M)

PART -B

2. a) Solve $\cosh x \frac{dy}{dx} + y \sinh x = 2\cosh^2 x \sinh x$. (7M)
   b) Find the orthogonal trajectories of $r^2 = a \sin 2\theta$. (7M)
3. a) Solve $(D^2 + 3D + 2)y = e^{-x} + Cosx$. (7M)
   b) Solve $(D^2 + 2D - 3)y = x^2 e^{-3x}$. (7M)
4. a) Find $L\left[e^{-3t}\int_0^t \frac{1-\cos t}{t^2}\,dt\right]$ (7M)
   b) Solve $y''' - 3y'' + 3y' - y = t^2 e^t$ given that $y = 1, y' = 0, y'' = -2$ at t = 0. (7M)
5. a) Determine whether the functions U $= \frac{x}{y-z}$, V $= \frac{y}{z-x}$, W$= \frac{z}{x-y}$ are dependent. If dependent find the relationship between them. (7M)
   b) Examine the function for extreme values $f(x, y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$. (7M)
6. a) Form a partial differential equation by eliminating a and b from $\log(az-1) = x + ay + b$. (7M)
   b) Solve $px(z - 2y^2) = (z - qy)(z - y^2 - 2x^3)$. (7M)
7. a) Solve $(D^2 - 4DD'+4D'^2)z = e^{2x+y}$. (7M)
   b) Classify the nature of the partial differential equation $\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x\,\partial y} + 4\frac{\partial^2 u}{\partial y^2} - \frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$. (7M)
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