Code No: R161102 **R16** SET - 1

I B. Tech I Semester Supplementary Examinations, May - 2018
MATHEMATICS-I

Time: 3 hours 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 **FOUR** Questions from **Part-B**

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PART –A

1. a) Solve the DE $y(xy + e^x)dx - e^x dy = 0$. (2M)

b) Solve the DE $y^{11} - 2y^1 + 10y = 0$, given y (0) = 4, y^1 (0) = 1. (2M)

c) If $u = \frac{x^2 y^2}{x+y}$ then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ (2M)

d) If $f(x, y, z) = e^{xyz}$ then find $\frac{\partial^3 f}{\partial x \partial y \partial z}$ (2M)

e) Find $L\{\delta(t-3)\}$ (2M)

f) Solve z=p(x+1)+q(y+2). (2M)

g) Classify the nature of the PDE $\frac{\partial^2 u}{\partial x^2} + 2\frac{\partial^2 u}{\partial x \partial y} + 4\frac{\partial^2 u}{\partial y^2} = 0$ (2M)

PART –B

2. a) A body kept in air with temperature 25^0C cools from 140^0C to 80^0C in 20 minutes. Find when the body cools down to 35^0C. (7M)

b) An R – L circuit has an Emf given (in volts) by 10 sin t, a resistance of 90 ohms, an inductance of 4 henries. Find the current at any time *t* by assuming zero initial current. (7M)

3. a) Solve the DE $(D^2 + 1)y$ = cotx by the method of variation of parameters (7M)

b) Determine the charge on the capacitor at any time t > 0 in circuit in series having an emf E(t) = 100 sin 60 t, a resistor of 2 ohms, an inductor of 0.1 henries and capacitor of $\frac{1}{260}$ farads, if the initial current and charge on the capacitor are both zero. (7M)

4. a) Evaluate $\int_0^\infty \frac{e^{-t} - e^{-2t}}{t} dt$ (7M)

b) Using Laplace transform solve $y(t) = sint + \int_0^t u\, y(t-u)\, du$ (7M)

5. a) Find the minimum value of $x^2 + y^2 + z^2$ subject to ax + by + cz = p. (7M)
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b) Check whether the following are functionally dependent or not, then find the relation between $u = \frac{x-y}{x+y}, v = \frac{xy}{(x+y)^2}$ (7M)

6. a) Find partial differential equation by eliminating arbitrary function $f(x^2+y^2, z-xy) = 0$ (7M)

b) Solve the PDE $\frac{p^2}{z^2} = 1 - pq$. (7M)

7. a) Solve the PDE $\left(D^2 - 3D - D^{1^2} + 3D^1\right)z = e^{x-2y}$ (7M)

b) Solve the PDE $\left(D - D^1 - 1\right)\left(D - D^1 - 2\right)z = x + e^{3x-y}$ (7M)

Code No: R161102 **R16** SET - 1

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 $r = \frac{2a}{1+\cos\theta}$, 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 $\frac{\partial(x,y,z)}{\partial(u,v,w)}$. (7M)
b) Find the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid $\frac{x^2}{4} + \frac{y^2}{9} + \frac{z^2}{25} = 1$. (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 $x^2\dfrac{\partial^2 u}{\partial x^2}+(1-y^2)\dfrac{\partial^2 u}{\partial y^2}=0,\ -\infty<x<\infty,\ -1<y<1.$ (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

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 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 $(x+2y^3)\dfrac{dy}{dx}=y$. (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) $Solve\ (D^2-2D+1)y=xe^xSin$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 $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$. (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 $\dfrac{\partial^2u}{\partial x^2}+2\dfrac{\partial^2u}{\partial x\,\partial y}+\dfrac{\partial^2u}{\partial y^2}=0$. (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

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 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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Code No: R161102 **R16** SET - 1

I B. Tech I Semester Supplementary Examinations, May - 2018
MATHEMATICS-I

Time: 3 hours 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 **FOUR** Questions from **Part-B**

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PART –A

1. a) Solve the DE $y(xy + e^x)dx - e^x dy = 0$. (2M)

b) Solve the DE $y^{11} - 2y^1 + 10y = 0$, given y (0) = 4, y^1 (0) = 1. (2M)

c) If $u = \dfrac{x^2 y^2}{x+y}$ then find $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y}$ (2M)

d) If $f(x, y, z) = e^{xyz}$ then find $\dfrac{\partial^3 f}{\partial x \partial y \partial z}$ (2M)

e) Find $L\{\delta(t-3)\}$ (2M)

f) Solve z=p(x+1)+q(y+2). (2M)

g) Classify the nature of the PDE $\dfrac{\partial^2 u}{\partial x^2} + 2\dfrac{\partial^2 u}{\partial x \partial y} + 4\dfrac{\partial^2 u}{\partial y^2} = 0$ (2M)

PART –B

2. a) A body kept in air with temperature 25^0C cools from 140^0C to 80^0C in 20 minutes. Find when the body cools down to 35^0C. (7M)

b) An R – L circuit has an Emf given (in volts) by 10 sin t, a resistance of 90 ohms, an inductance of 4 henries. Find the current at any time t by assuming zero initial current. (7M)

3. a) Solve the DE $(D^2 + 1)y$ = cotx by the method of variation of parameters (7M)

b) Determine the charge on the capacitor at any time t > 0 in circuit in series having an emf E(t) = 100 sin 60 t, a resistor of 2 ohms, an inductor of 0.1 henries and capacitor of $\dfrac{1}{260}$ farads, if the initial current and charge on the capacitor are both zero. (7M)

4. a) Evaluate $\int_0^\infty \frac{e^{-t} - e^{-2t}}{t} dt$ (7M)

b) Using Laplace transform solve $y(t) = sint + \int_0^t u\, y(t-u)\, du$ (7M)

5. a) Find the minimum value of $x^2 + y^2 + z^2$ subject to ax + by + cz = p. (7M)
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b) Check whether the following are functionally dependent or not, then find the relation between $u=\frac{x-y}{x+y}, v=\frac{xy}{(x+y)^2}$ (7M)

6. a) Find partial differential equation by eliminating arbitrary function $f(x^2+y^2, z-xy)=0$ (7M)

b) Solve the PDE $\frac{p^2}{z^2}=1-pq$. (7M)

7. a) Solve the PDE $\left(D^2-3D-D^{1^2}+3D^1\right)z=e^{x-2y}$ (7M)

b) Solve the PDE $\left(D-D^1-1\right)\left(D-D^1-2\right)z=x+e^{3x-y}$ (7M)