## R13

## SET - 1

## I B. Tech I Semester Supplementary Examinations, May - 2017 MATHEMATICS-I <br> (Common to All Branches)

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 THREE Questions from Part-B

## PART - A

1. a) Explain the method of solving Bernoulli equation.
b) Solve $\left(D^{4}+2 D^{2} n^{2}+n^{4}\right) y=0$.
c) State and prove change of scale property of Laplace transforms.
d) Verify the chain rule for Jacobians if $x=u, y=u \tan v, z=w$.
e) Form the partial differential equation by eliminating the arbitrary function $f$ from
$x y+y z+z x=f\left(\frac{z}{x+y}\right)$.
f) State all possible solutions of Laplace's equation.

## PART -B

2. a) The number $N$ of bacteria in a culture grows at a rate proportional to $N$. The value of $N$ was initially 100 and increased to 332 in one hour. What was the value of $N$ after $1 \frac{1}{2}$ hour?
b) Solve $(x-y) d x-d y=0, y(0)=2$.
3. Solve $\left(D^{2}-4 D+4\right) y=x^{2} \sin x+e^{2 x}+3$.
4. a) Evaluate $L\left\{\int_{0}^{t} e^{-t} \cos t d t\right\}$
b) Solve the differential equation using Laplace transforms
$\frac{d^{2} x}{d t^{2}}+3 \frac{d x}{d t}+2 x=e^{-t} ; x(0)=0, x^{\prime}(0)=1$.
5. a) Find the minimum and maximum values of $\sin x+\sin y+\sin (x+y)$.
b) If $u=\frac{1}{\sqrt{x^{2}+y^{2}+z^{2}}}, x^{2}+y^{2}+z^{2} \neq 0$ then evaluate $\frac{\partial^{2} u}{\partial x^{2}}+\frac{\partial^{2} u}{\partial y^{2}}+\frac{\partial^{2} u}{\partial z^{2}}$.
6. a) Solve $q^{2} y^{2}=z(z-p x)$. Also, find the general solution of $y^{2} z p+x^{2} z q=y^{2} x$.
b) Solve $x^{2}(y-z) p+y^{2}(z-x) q=z^{2}(x-y)$.
7. An infinitely long plane uniform plate is bounded by two parallel edges and an end at right angles to them. The breadth is $\pi$; this end is maintained at a temperature $u_{0}$ at all points and other edges are at zero temperature. Determine the temperature at any point of the plate in the steady-state.
