

## I B. Tech I Semester Supplementary Examinations, May - 2017

## MATHEMATICS-I

(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. (3M)
- b) Solve  $(D^4 + 2D^2n^2 + n^4)y = 0$ . (4M)
- c) State and prove change of scale property of Laplace transforms. (4M)
- d) Verify the chain rule for Jacobians if  $x = u$ ,  $y = u \tan v$ ,  $z = w$ . (4M)
- e) Form the partial differential equation by eliminating the arbitrary function  $f$  from  $xy + yz + zx = f\left(\frac{z}{x+y}\right)$ . (4M)
- f) State all possible solutions of Laplace's equation. (3M)

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? (9M)
- b) Solve  $(x - y)dx - dy = 0, y(0) = 2$ . (7M)
3. Solve  $(D^2 - 4D + 4)y = x^2 \sin x + e^{2x} + 3$ . (16M)
4. a) Evaluate  $L\left\{\int_0^t e^{-t} \cos t dt\right\}$ . (6M)
- b) Solve the differential equation using Laplace transforms (10M)  
 $\frac{d^2x}{dt^2} + 3\frac{dx}{dt} + 2x = e^{-t}; x(0) = 0, x'(0) = 1$ .
5. a) Find the minimum and maximum values of  $\sin x + \sin y + \sin(x + y)$ . (9M)
- b) If  $u = \frac{1}{\sqrt{x^2 + y^2 + z^2}}, x^2 + y^2 + z^2 \neq 0$  then evaluate  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$ . (7M)
6. a) Solve  $q^2 y^2 = z(z - px)$ . Also, find the general solution of  $y^2 zp + x^2 zq = y^2 x$ . (10M)
- b) Solve  $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$ . (6M)
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. (16M)

