

**I B. Tech I Semester Supplementary Examinations, July/August- 2021**  
**MATHEMATICS-I**

Time: 3 hours

Max. Marks: 70

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

**PART -A**

1. a) Define Exact differential equation (2M)
- b) Find the P.I of  $\frac{d^2y}{dx^2} + 4y = x$  (2M)
- c) Find  $L^{-1}\left(\frac{3}{(s-2)^4}\right)$  (2M)
- d) Find  $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$  if  $u = \sin^{-1}\left(\frac{y}{x}\right)$  (2M)
- e) Write Laplace transform of  $\cosh 2t$  (2M)
- f) Solve the PDE  $p + q = 1$  (2M)
- g) Classify the PDE  $4\frac{\partial^2 u}{\partial x^2} - 4\frac{\partial^2 u}{\partial x\partial y} + 2\frac{\partial^2 u}{\partial y^2} = 0$  (2M)

**PART -B**

2. a) Solve the ODE  $x\frac{dy}{dx} + y = \log x^2$  (7M)
- b) The growth rate of bacteria population is proportional to its size. Initially the population is 10,000 after 5 days it is 20,000. What is the population after 15 days (7M)
3. a) Solve the ODE  $(D^2 + D)y = x^2 + 2x + 4$  (7M)
- b) By Method variation of parameters solve the ODE  $(D^2 + 4)y = 2 \operatorname{cosec} 2x$  (7M)
4. a) By convolution find  $L^{-1}\left(\frac{s^2}{(s^2 + 4)(s^2 + 9)}\right)$  (7M)
- b) Evaluate  $\int_0^{\infty} e^{-3t} \frac{(1 - \cos 2t)}{t} dt$  (7M)
5. a) Expand  $\log(\sec x)$  about  $x = 0$  using Taylor's series expansion (7M)
- b) Determine whether the functions  $u = xy + yz + zx, v = x^2 + y^2 + z^2, w = x + y + z$  are functionally dependent or independent if so, find the relation between them. (7M)
6. a) Solve the PDE  $p - q = \log(x + y)$  (7M)
- b) Solve the PDE  $p^2 z^2 + q^2 = p^2 q$  (7M)
7. a) Solve the PDE  $(D^2 + DD^1 - 6D^1^2)z = \cos(x + y)$  (7M)
- b) Solve the PDE  $(D^2 - 2DD^1)z = x^3 y + e^{2x}$  (7M)