

**B.TECH.**  
**(SEM II) THEORY EXAMINATION 2018-19**  
**MATHEMATICS-II**

Time: 3 Hours

Total Marks: 70

Note: Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

1. Attempt all questions in brief. 2 x 7 = 14

- a. Find the solution of the differential equation  $(D^2 + 9)y = 0$
- b. Find the P.I. of the D.E.  $(D^2 + 4)y = \sin 2x$
- c. Find the value of  $J_{\frac{1}{2}}(x)$ .
- d. Find  $L(\sin^2 t)$ .
- e. Evaluate  $L\{\delta(t - a)\}$ .
- f. Find the solution of the partial differential equation:  $(r + b^2t) = 0$ .
- g. Write the one dimensional heat equation in unsteady state.

## SECTION B

2. Attempt any three of the following: 7 x 3 = 21

- a. Solve  $\frac{d^3y}{dx^3} = \log x$ .
- b. Obtain series solution  $8x^2 \frac{d^2y}{dx^2} + 10x \frac{dy}{dx} - (1 + x)y = 0$ .
- c. Solve the differential equation  $(D^2 + 2D + 5)y = e^{-t} \sin t, y = 0, \frac{dy}{dt} = 1$  at  $t = 0$  by using laplace transform.
- d. Find the Fourier series of  $f(x) = x^3$  in  $(-\pi, \pi)$ .
- e. Solve Laplace equation in a rectangle in the  $0 < x < a$  and  $0 < y < b$  satisfying the following boundary conditions  $u(x,0)=0, u(x,b)=0, u(0,y)=0$  and  $u(a,y)=ky(b-y)$

## SECTION C

3. Attempt any one part of the following: 7 x 1 = 7

- (a) Solve the simultaneous linear D.E.  $\frac{dx}{dt} = y + 1, \frac{dy}{dt} = x + 1$ .
- (b) Solve the D.E.  $:(D^2 + 1)y = \operatorname{cosec} x$ .

4. Attempt any one part of the following: 7 x 1 = 7

- (a) Show that  $J_n(x)$  is an even function when  $n$  is even and odd function when  $n$  is odd.
- (b) Establish the Generating function for Legendre Polynomial.

5. Attempt any one part of the following: 7 x 1 = 7

- (a) Evaluate:  $L \left\{ \int_0^t \frac{\sin u}{u} du \right\}$ .

(b) Evaluate:  $L^{-1} \left\{ \frac{1}{2} \log \frac{s^2+a^2}{s^2+b^2} \right\}$ .

6. Attempt any *one* part of the following:

7 x 1 = 7

(a) Solve the partial differential equation  $z_{xx} - z_{xy} - 2z_{yy} = (y - 1)e^x$ .

(b) Solve the P.D.E.:  $(6D_x^2 + 5D_xD_y - 6D_y^2)z = 132 \log(x + 3y)$ .

7. Attempt any *one* part of the following:

7 x 1 = 7

(a) Solve the following PDE by the method of separation of variables:  $3u_x + 2u_y = 0$  with  $u(x, 0) = 4e^{-x}$ .

(b) Solve the following PDE by the method of separation of variables:  $u_{xx} - u_y = 0$ .

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