

**Reg. No.**

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# **B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019**

Third Semester

MA18351 – ENGINEERING MATHEMATICS - III

**(Common to BT, CH, CE, EE, EC and ME)**

(Regulation 2018)

## Time: Three Hours

## **Maximum : 100 Marks**

## Answer ALL questions

**PART A - (10 X 2 = 20 Marks)**

	CO	RBT
1. Find the partial differential equation by eliminating the arbitrary constants from the relation $z = ax + by + ab$	1	R
2. Find the Particular integral of $(D^2 + 5DD' + 6D'^2)z = e^{x+y}$	1	R
3. State the Dirichlet's conditions.	2	R
4. Find the root mean square value of a function $f(x) = 1$ in the interval $(0, 1)$ .	2	U
5. State the possible solutions of one dimensional wave equation.	3	R
6. Classify the given partial differential equation $U_{xx} - 2U_{xy} + U_{yy} = 0$	3	U
7. State the Parsevals' identity for Fourier cosine and sine transforms.	4	R
8. Find the Fourier cosine transform of $e^{-ax}$	4	R
9. Find $Z[na^n]$ .	5	U
10. State the convolution theorem for Z-transform.	5	R

**PART B - (5 X16 = 80 Marks)**

11. (a) (i) Solve  $(y^2 + z^2 - x^2)p - 2xyq + 2xz = 0$  (8) 1 AP  
(ii) Solve  $(D^2 + 3DD' + 2D'^2)z = e^{2x+y} + \cos(x+y)$  (8) 1 AP

(OR)

- (b) (i) Eliminate the arbitrary function and form PDE (8) 1 AP

$$\phi(x + y + z, x^2 + y^2 + z^2) = 0$$

12. (a) (i) Find the Fourier series for  $f(x) = e^{ax}$  in the interval  $(0, 2\pi)$ . (8) 2 AP  
(ii) Find the half range cosine series for  $f(x) = \pi x - x^2$  in the interval  $0 \leq x \leq \pi$  (8) 2 AP

(OR)

- (b) (i) Find the half range cosine series for  $f(x) = x^2$  in  $0 < x < \pi$ , (8) 2 AP  
 Hence deduce that

$$\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \dots = \frac{\pi^4}{90}.$$

- (ii) Analyze harmonically up to first two harmonics from the following data: (8) 2 AP

X	0	$\pi/3$	$2\pi/3$	$\pi$	$4\pi/3$	$5\pi/3$	$2\pi$
f(x)	1	1.4	1.9	1.7	1.5	1.3	1

13. (a) A string is stretched and fastened to two points  $x = 0$  and  $x = l$ . It is initially at rest in its equilibrium position. It is set to vibrate by giving each of its points a velocity  $\lambda x(l - x)$ , where  $\lambda$  is a constant. Find the displacement of the string at any distance  $x$  from one end at any time  $t$ . (16) 3 AP

(OR)

- (b) An infinitely long rectangular plate of width  $a$  cm with insulated surfaces has its temperature equal to zero on both long sides and one of the shorter sides. Given that  $u(x,0) = \lambda x$  where  $\lambda$  is a constant. Find the steady state temperature distribution at any point  $(x,y)$ . (16) 3 AP

14. (a) (i) Find the Fourier transform of  $f(x) = a^2 - x^2$ ,  $|x| \leq a$  and  $f(x) = 0$ , otherwise. (8) 4 AP

- (ii) Evaluate the integral using Fourier transform (8) 4 AP

$$\int_0^\infty \frac{dx}{(x^2 + a^2)(x^2 + b^2)}.$$

(OR)

- (b) Find the Fourier transform  $f(x) = a - |x|$ ,  $|x| \leq a$  and (16) 4 AP

$f(x) = 0$ , otherwise, Hence deduce that

$$(i) \int_0^\infty \left( \frac{\sin t}{t} \right)^2 dt = \frac{\pi}{2} \text{ and } (ii) \int_0^\infty \left( \frac{\sin t}{t} \right)^4 dt = \frac{\pi}{3}$$

15. (a) (i) Find Z-transform of  $\frac{1}{n(n+1)}$  (8) 5 AP

- (ii) Find the inverse Z-Transform of  $\frac{z^2 + z}{(z-1)(z^2 + 1)}$  (8) 5 AP

(OR)

- (b) (i) Solve the difference equation  $y_{n+2} - 7y_{n+1} + 12y_n = 2^n$ , given that  $y_0 = 0$  and  $y_1 = 0$ . by using Z-transform. (8) 5 AP

- (ii) Using convolution theorem, find the inverse Z-transform of (8) 5 AP

$$\frac{z^2}{(z-a)^2}$$