- 15. (a) (i) Find the Z-transforms of $\cos \frac{n\pi}{2}$ and $\frac{1}{n(n+1)}$. (8)
 - (ii) Using convolution theorem, evaluation $Z^{-1}\left\{\frac{z^2}{(z-a)^2}\right\}$. (8)

- (b) (i) Find the inverse Z-transform of $\frac{z}{z^2 2z + 2}$ by residue method. (8)
 - (ii) Solve the difference equation $y_{n+2} + y_n = 2$, given that $y_0 = 0$ and $y_1 = 0$ by using Z-transforms. (8)

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Question Paper Code: 57502

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B.E./B. Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Third Semester

Civil Engineering

MA 6351 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all branches except Environmental Engineering, Textile Chemistry, Textile Technology, Fashion Technology and Pharmaceutical Technology)

(Regulations 2013)

Time: Three Hours

Maximum: 100 Marks

Answer ALL questions.

 $PART - A (10 \times 2 = 20 Marks)$

Form the partial differential equation by eliminating the arbitrary functions from $f(x^2 + y^2, z - xy) = 0.$

- Find the complete solution of the partial differential equation $p^3 q^3 = 0$.
- 3. Find the value of the Fourier series of $f(x) = \begin{cases} 0 & \text{in } (-c, 0) \\ 1 & \text{in } (0, c) \end{cases}$ at the point of discontinuity x = 0.
- Find the value of b_n in the Fourier series expansion of f(x) = 0

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5.	Classify the partial differential equation $u_{xx} + u_{xy} = f(x, y)$.	
6.	Write down all the possible solutions of one dimensional heat equation.	
7.	State Fourier integral theorem.	
8.	Find the Fourier transform of a derivative of the function $f(x)$ if $f(x) \to 0$ as $x \to \pm \infty$.	
9.	Find $Z\left\{\frac{1}{n!}\right\}$	
10.	Find $Z \{(\cos \theta + i \sin \theta)^n\}$.	
9	and to all bear eiges except the community tenging of the Charles	
	$PART - B (5 \times 16 = 80 Marks)$	
		1.0
11.	(a) (i) Solve the equation $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$.	(8)
	(ii) Find the singular integral of the equation $z = px + qy + \sqrt{1 + p^2 + q^2}$.	(8)
	OR	
	(b) (i) Solve: $(D^3 - 2D^2D')z = 2e^{2x} + 3x^2y$.	(8)
	(ii) Solve: $(D^2 + 2DD' + D'^2 - 2D - 2D')z = \sin(x + 2y)$	(8)
	in the state of th	
12.	(a) (i) Find the Fourier series of $f(x) = x$ in $-\pi < x < \pi$.	(6)
	(ii) Find the Fourier series expansion of $f(x) = \cos x $ in $-\pi < x < \pi$.	(10)
	OR	
	(b) (i) Find the half range sine series of $f(x) = x \cos \pi x$ in (0, 1).	(8)

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(ii) Find the Fourier cosine series up to third harmonic to represent the function given by the following data: 8 15 7 6 2

13. (a) Find the displacement of a string stretched between two fixed points at a distance of 21 apart when the string is initially at rest in equilibrium position and points of the string are given initial velocities ν where ν = (16) distance measured from one end.

OR

steady state temperature function u(x, y).

(b) A long rectangular plate with insulated surface is l cm wide. If the temperature along one short edge is $u(x, 0) = k(lx - x^2)$ for 0 < x < l, while the other two long edges x = 0 and x = 1 as well as the other short edge are kept at 0 °C, find the (16)

14. (a) Find the Fourier cosine and sine transform of $f(x) = e^{-ax}$ for $x \ge 0$, a > 0. Hence deduce the integrals $\int \frac{\cos sx}{a^2 + s^2} ds$ and $\int \frac{s \sin sx}{a^2 + s^2} ds$. (16)

(b) (i) Find the Fourier transform of $f(x) = e^{-\frac{x}{2}}$ in $(-\infty, \infty)$. (8)

(ii) Find the Fourier transform of f(x) = 1 - |x| if |x| < 1 and hence find the

value of
$$\int_{0}^{\infty} \frac{\sin^4 t}{t^4} dt$$
. (8)

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