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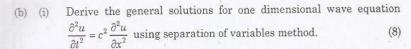
(A)	Reg. No.: Question Paper Code: 25141
	B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.
	Third Semester
1 32	Civil Engineering
	MA 8353 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS
	(Common to: Electrical and Electronics Engineering / Industrial Engineering and Management / Chemical and Electrochemical Engineering / Aeronautical Engineering / Agriculture Engineering / Automobile Engineering / Electronics and Instrumentation Engineering / Industrial Engineering / Instrumentation and Control Engineering / Manufacturing Engineering / Marine Engineering / Material Science and Engineering / Mechanical Engineering / Mechanical Engineering (Sandwich) / Mechanical and Automation Engineering / Mechatronics Engineering / Production Engineering / Robotics and Automation Engineering / Bio Technology/ Food Technology and Pharmaceutical Technology)
	(Regulations 2017)
2	Time : Three hours Maximum : 100 marks Answer ALL questions. $PART\ A \longrightarrow (10 \times 2 = 20\ marks)$
	What are singular integrals? How does it differ from particular integral?
	 Solve 2 \frac{\partial^2 z}{\partial x^2} + 5 \frac{\partial^2 z}{\partial x \partial y} + 2 \frac{\partial^2 z}{\partial y^2} = 0. What is the behavior of Fourier series of a function f(x) at the point of discontinuity?
.,	4. Sketch the even and odd extensions of the periodic function $f(x) = x^2$ for $0 < x < 2$

- 5. Classify the partial differential equation $2x\frac{\partial^2 u}{\partial x^2} + 4x\frac{\partial^2 u}{\partial x \partial y} + 8x\frac{\partial^2 u}{\partial y^2} = 0$
- 6. Mention the various possible general solutions for one dimensional heat equation.
- 7. Does Fourier sine transform of $f(x) = k, 0 \le x \le \infty$, exist? Justify your answer.

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8.	State co	nvolution theorem for Fourier transforms.
9.	What a	e the applications of Z-Transform?
10.	Find th	$z Z$ transform of $f(n) = (n+1)^2$.
		PART B (5 × 16 = 80 marks)
11.	(a) (i)	
	· (ii	
		$\frac{\partial^2 z}{\partial x^2} - 4x \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = e^{2x+y}.$ (8)
		Or
	(b) (i)	Solve the Lagrange's linear equation $(x^2 - yz) p + (y^2 - zx) q = z^2 - xy. $ (8)
	(ii	
		$(D^2 + 2DD' + D'^2 - 2D - 2D')z = \sin(x + 2y). $ (8)
12.	(a) (i)	Obtain the Fourier series of the periodic function $f(x) = e^{ax}$ in the interval $0 \le x \le 2\pi$. (8)
	(ii	$\left[1+\frac{2x}{2}, -\pi \le x \le 0\right]$
		Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$. (8)
		Or
	(b) (i)	Find the complex form of the Fourier series for $f(x) = e^{-x}$, in $-1 \le x \le 1$. (8)
	(ii	Develope the half range Fourier series for the function $f(x) = x^3$ in $(0, L)$.
13.	(a) (i)	Using the method of separation of variables solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$,
	4	where $u(x,0) = 6e^{-3x}$. (8)
	(i	
		initial temperature in the bar is $u(x,0) = 100 \sin\left(\frac{\pi x}{80}\right)$ and
		$L = 80 \ cm.$ (80)
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- (ii) Find the displacement of a string stretched between two fixed points at a distance L apart. The string is initially at rest in equilibrium position and points of the string are given initial displacement $u(x,0) = k(Lx x^2)$. Assume initial velocity zero. (8)
- 14. (a) (i) Find the Fourier transform of $f(x) = \begin{cases} 1 x^2, & |x| \le 1 \\ 0, & |x| \ge 1 \end{cases}$. Hence deduce $\int_0^\infty \frac{x \cos x \sin x}{x^3} \cos\left(\frac{x}{2}\right) dx.$ (10)
 - (ii) Construct the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$. (6)

Or

- (b) (i) Find the Fourier cosine transforms of $f(x) = e^{-ax}$ and $g(x) = e^{-bx}$. Using these transforms and Parseval's identity show that $\int_0^\infty \frac{dt}{(a^2 + t^2) (b^2 + t^2)} = \frac{\pi}{2ab(a+b)}.$ (10)
 - (ii) Find the Fourier transform of $f(x) = \cos x$, $0 \le x \le 1$. (6)
- 15. (a) (i) Form the difference equation corresponding to the family of curves $y = ax + bx^2$. (8)
 - (ii) Find the Z transform of $u(n) = 3n 4\sin\left(\frac{n\pi}{4}\right) + 5a$, and $u(n) = \cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right).$ (8)

Or

- (b) (i) Use convolution theorem to evaluate the inverse Z transform of $U(z) = \frac{z^2}{(z-a)(z-b)} \,. \tag{6}$
 - (ii) Solve the difference equation $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with initial conditions $y_0 = y_1 = 0$, using Z transform. (10)

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