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Reg. No.:				

Question Paper Code: 53248

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third Semester

Civil Engineering

MA 6351 — TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to Mechanical Engineering (Sandwich)/Aeronautical
Engineering/Agriculture Engineering/Automobile Engineering/Biomedical
Engineering/Computer Science and Engineering/Computer and Communication
Engineering/Electrical and Electronics Engineering/Electronics and Communication
Engineering/Electronics and Instrumentation Engineering/Geoinformatics
Engineering/Industrial Engineering/ Industrial Engineering and
Management/Instrumentation and Control Engineering/Manufacturing
Engineering/Marine Engineering/Materials Science and Engineering/Mechanical
Engineering/Mechanical and Automation Engineering/Mechatronics
Engineering/Medical Electronics/Petrochemical Engineering/Production
Engineering/Robotics and Automation Engineering/Bio Technology/Chemical
Engineering/Chemical and Electrochemical Engineering/Food
Technology/Information Technology/Petrochemical Technology/Petroleum
Engineering/Plastic Technology/Polymer Technology)

(Regulation 2013)

Time: Three hours

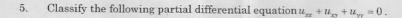
Maximum: 100 marks

Answer ALL questions.

PART A —
$$(10 \times 2 = 20 \text{ marks})$$

- 1. Form the partial differential equation by eliminating the arbitrary function f from $z = f\left(\frac{y}{x}\right)$.
- 2. Find the complete solution of the partial differential equation $\sqrt{p} + \sqrt{q} = 1$.
- 3. State Dirichlet condition for existence of Fourier series.
- 4. If $(\pi x)^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty} \frac{\cos nx}{n^2}$, in $0 < x < 2\pi$, then deduce the value of $\sum_{n=1}^{\infty} \frac{1}{n^2}$.

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- 6. What are the possible solutions of the one dimensional heat flow equation.
- 7. Find the Fourier sine transform of e-ax
- 8. Define self reciprocal function under Fourier transform with example.
- 9. Find the Z transform of a constant 'a'.
- 10. If $Z\{f(n)\}=\frac{z^2}{z^2+1}$, then find f(0), using initial value theorem.

PART B —
$$(5 \times 16 = 80 \text{ marks})$$

- 11. (a) (i) Find the singular solution of $z = px + qy + p^2q^2$. (8)
 - (ii) Solve $(D^2 2DD')z = x^3y + e^{2x}$. (8)

Or

- (b) (i) Find the complete solution of $p^2 + q^2 = x^2 + y^2$. (8)
 - (ii) Find the general solution of (y-z)p+(z-x)q=(x-y). (8)
- 12. (a) (i) Find the Fourier series of $f(x) = x^2$ in $-\pi < x < \pi$. (8)
 - (ii) Find the half range sine series expansion of $x(\pi x)$ in $0 < x < \pi$. (8)
 - (b) (i) Compute the first two harmonics of the Fourier series of f(x) from the table given (8)

$$x = 0$$
 $\pi/3$ $2\pi/3$ π $4\pi/3$ $5\pi/3$ 2π $f(x)$ 1.0 1.4 1.9 1.7 1.5 1.2 1.0

- (ii) Obtain the Fourier cosine series expansion of f(x) = x in 0 < x < l.(8)
- 13. (a) A tightly stretched siring with fixed end points x = 0 and x = l is initially at rest in its equilibrium position. If it is set vibrating each point a velocity 3x(l-x), find the displacement of the string. (16)

Or

(b) A rectangular plate with insulated surface is bounded by the lines x = 0, x = a, y = 0 and y = b. The temperature along the edge y = b kept at 100°C, while the temperature along the other three edges are at 0°C, find the steady - state temperature at any point in the plate. (16)

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- 14. (a) Find the Fourier transform of $f(x) = \begin{cases} 1 |x|, & \text{if } |x| < 1 \\ 0, & \text{otherwise} \end{cases}$. Hence deduce the values of
 - (i) $\int_{0}^{\infty} \frac{\sin^2 t}{t^2} dt,$
 - (ii) $\int_{0}^{\infty} \frac{\sin^4 t}{t^4} dt.$ (16)

Or

- (b) (i) Find the Fourier transform of $e^{-a^2x^2}$, where a > 0. (8)
 - (ii) Use transform methods to evaluate $\int_{0}^{\infty} \frac{dx}{(x^2 + a^2)(x^2 + b^2)}.$ (8)
- 15. (a) (i) Find the inverse Z-transform of $\frac{z^2}{(z-a)^2}$ by using convolution theorem. (8)
 - (ii) Solve $u_{n+2}+6u_{n+1}+9u_n=2^n$ with $u_0=0$, $u_1=0$, by using Z-transforms. (8)

Or

- (b) (i) Find Z-transform of $\frac{1}{n(n+1)}$. (8)
 - (ii) Find the inverse Z-transform of $\frac{z^2+z}{(z^2+1)(z-1)}$. (8)

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