

MA-220 (CE/TX)
B.E. IV Semester
Examination, June 2017
Choice Based Credit System (CBCS)
Mathematics - III
Time : Three Hours] [Maximum Marks : 60

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. (a) Find the Fourier series expansion of the function $f(x) = |x|$ for $-\pi \leq x \leq \pi$. Hence deduce that

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$$

(b) Develop $\sin\left(\frac{\pi x}{l}\right)$ in a half range cosine series in the range $0 < x < l$.

2. a) Find the Fourier transform of e^{-ax^2} , where $a > 0$

b) Find the Fourier sine transform of

$$f(x) = e^{-3x} + e^{-4x}$$

3. a) Solve $\frac{d^2 y}{dx^2} - y = -f(x)$, $\lim_{|x| \rightarrow \infty} y(x) = 0$

b) Solve the following integral equation to obtain $f(x)$ $\int_0^\infty f(x) \sin px dx = e^{-ap}$

4. a) State and prove change of scale property of Laplace transform.

b) Evaluate $L^{-1}\left\{\frac{p^2}{p^4 + 4a^4}\right\}$

5. a) Using convolution theorem, evaluate

$$L^{-1}\left\{\frac{1}{(p^2 + 9)(p + 3)}\right\}$$

b) Solve $(D+1)^2 y = 3te^{-t}$, $t > 0$ with $y = 4$, $Dy = 2$ where $t = 0$

6. a) Show that the function $u = x^3 - 3xy^2$ is harmonic and find the corresponding analytic function.

(b) Using Cauchy's integral formula evaluate $\int_c \frac{e^{2z}}{(z-1)(z-2)} dz$ if c is the circle $|z| = 3$

7. Evaluate $\int_0^\pi \frac{d\theta}{(a + \cos \theta)^2} = \frac{\pi a}{(a^2 - 1)^{\frac{3}{2}}}$ ($a > 1$)

8. a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places.

b) Find a real root of the equation $x^3 - 2x - 5 = 0$ by using secant method correct to three decimal places.
