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Roll No ....

MA-220 (AU/ME/CM/FT/MI)

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 of $f(x) = \frac{1}{2}(\pi - x)$ in the interval

 (0, 2π) Hence deduce that

 $$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + ...$$

 b)   Find the half range cosine series of $f(x) = x(\pi - x)$ in the interval (0, π) and hence deduce that

 $$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + ...$$

2. a)   Find the Fourier transform of

 $$f(x) = \begin{cases} 1 & |x| < 9 \\ 0 & |x| > 9 \end{cases}$$

 Hence find the value of $\int_0^\infty \frac{\sin x}{x} dx$

 b)   Find the Fourier cosine transform of

 $$f(x) = \begin{cases} x & 0 < x < 1 \\ 2 - x & 1 < x < 2 \\ 0 & x > 2 \end{cases}$$

3. a)   State and prove second shifting theorem.

 b)   Show that $\int_0^\infty \frac{\cos 6t - \cos 4t}{t} = \log \frac{2}{3}$

4. a)   i)   Find the Inverse Laplace transform of the $\tan^{-1} \frac{2}{p}$

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

 b)   Solve $(D^2 + 9)y = 18t, y(0) = 0, y\left(\frac{\pi}{2}\right) = 1$

5. a)   Show that the function $e^x(\cos y + i \sin y)$ is Holomorphic and find its derivatives.

 b)   Evaluate the Integral

 $$\int_0^{1+i} Z^2 dz$$

6. a)   State and prove Cauchy's theorem.

 b)   Determine the pole of the function $f(z) = \frac{z^2}{(z+1)^2(z+2)}$

 and residue at each pole.

7. a) Use Picard's method of successive approximation obtain a solution upto third approximation of differential equation.

$$\frac{dy}{dx} = x + y^2 \text{ where } y(0) = 0$$

b) Employ Taylor's series method to obtain approximate value of y at $x = 0.2$ for the differential equation

$$\frac{dy}{dx} = x^2 y - 1, y(0) = 1$$

8. a) Using Euler's method solve for y at $x = 0.1$ from

$$\frac{dy}{dx} = x + y + xy, y(0) = 1 \text{ taking } h = 0.025.$$

b) Apply Runge Kutta Fourth order method to find an approximate value of y when $x = 0.2$ given that

$$\frac{dy}{dx} = x + y, y(0) = 1$$

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