Roll No. **Total No. of Pages : 03**

Total No. of Questions : 09

B.Tech.(CSE / IT) (2011 Batch) (Sem.–4)

ENGINEERING MATHEMATICS – III

Subject Code : BTCS-402

Paper ID : [A1184]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**
4. **Use of statistical table and non-programmable calculator is allowed.**

SECTION–A

1. Write briefly :

(a) State giving reasons whether $f(x) = \sin\frac{1}{x}$ can be expanded in Fourier series in the interval $-\pi \le x \le \pi$. If yes, write down the corresponding Euler's formula.

(b) If $L(f(t)) = f(s)$, then find $L\left\{\int_0^t f(t)dt\right\}$.

(c) Express the function $f(t)=\begin{cases} 0, 0<t<1, \\ t-1, 1<t<2, \\ 1, t>2. \end{cases}$ in terms of unit step function and find its Laplace transform.

(d) Solve : $4r + 12s + 9t = 0$.

(e) Find the constants a,b,c such that $f(z) = x - 2ay + i(bx - cy)$ is analytic.

(f) Using the C-R equations, prove that $f(z) = \bar{z}$ is not analytic at any point.

(g) Find the Eigen-values and the corresponding Eigen-vectors.

(h) By Gauss elimination method, solve $x + y = 2$, $2x + 3y = 5$.

(i) Using Runge-Kutta method of order 4, find the value of $y(0.1)$ for $y' = x - 2y$, $y(0) = 1$.

(j) Write down different properties of χ^2-distribution.

SECTION-B

2. Find the Laplace transforms of

(i) $f(t) = \dfrac{e^{-t}\sin t}{t}$

(ii) $f(t) = t^2 e^t \sin 4t$.

3. Examine the continuity of the functions :

(i) $f(z) = \begin{cases} \dfrac{\operatorname{Re}(z^2)}{|z|^2}, & z \neq 0, \\ 0, & z = 0. \end{cases}$

(ii) $f(z) = \begin{cases} e - \dfrac{1}{z^2}, & z \neq 0, \\ 0, & z = 0. \end{cases}$ at $z = 0$.

4. Solve the following equations by Gauss-Seidel iteration method :

$2x + 15y + 6z = 72,$

$-x + 6y + 27z = 85$

$54x + y + z = 110$

5. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

6. A random sample of size 16 has 53 as mean. The sum of squares of the derivation from mean is 135. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% and 99% confidence limits of the mean of the population.

SECTION-C

7. (a) Find the Fourier series of the periodic function

$$f(x)=\begin{cases} 0, -l < x \le 0, \\ E\sin\omega x, 0 < x < l \end{cases} \text{ with period } T = 2l = \frac{2\pi}{\omega}.$$

(b) If $f(z)$ is an analytic function with constant modulus, then prove that $f(z)$ is constant.

8. (a) Find the general solution of the partial differential equation :

$(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$.

(b) Using modified Euler's method, find an approximate value of y when $x = 0.3$,

given that $\frac{dy}{dx} = x + 2y$ and $y = 1$ when $x = 0$ (Take $h = 0.1$).

9. A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the number of days in a year on which

(i) neither car is on demand

(ii) a car demand is refused