Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 08

M.Tech. (EE) (Sem.–2)

ADVANCED MATHEMATICS

Subject Code : ELE-507

M.Code : 36003

Time : 3 Hrs. **Max. Marks : 100**

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE questions.**
2. **Each question carries equal marks.**

1. a) Find the Laplace transform of sin 2t sin 3t.

   b) Find the Fourier series to represent $x - x^2$ from $x = -\pi$ to $x = \pi$.

2. a) Define convolution of two functions $f(x)$ and $g(x)$ over the interval $(-\infty, \infty)$ and Convolution theorem for Fourier transforms.

   b) Find the Fourier cosine transform of e^{-x^2}.

3. Explain briefly the concept of differential equations to electric networks.

4. The forced van der Pol equation $d^2u/dt^2 + (u^2 - 1)\, du/dt + u = f(t)$ arises in the modeling of an electrical circuit with a triode whose resistance changes with the current. Convert the van der Pol equation into an equivalent first order system and solve.

5. Discuss the structure of trajectory near an equilibrium point.

6. Establish the mean and variance of a binormal distribution.

7. A random variable has following probability distributions.

X	0	1	2	3	4	5	6	7
f(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

   a) Find k for given f(x) is a probability mass function.

   b) Determine the probability distribution and distribution function.

   c) Evaluate P(X<6), P(X≥6) and P(0<X<5)

8. a) An environmental instrumentation company received 75% of its voltage regulators from supplier A and 25% from supplier B. It was found that 90% of the regulators of A and 85% from B perform according to the specifications. What is the probability that regulators came from supplier A given that it performs according to the specifications.

b) A random variable X can assume the value 1 and –1 with probability ½ each. Find :

a. The moment generating function

b. The first four moments around the origin

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.