Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. (EE / Power System) (Sem.–2)

ADVANCED MATHEMATICS

Subject Code : ELE/PEE-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) What do you mean by Inverse Laplace transform & z-transform

   b) Explain Fast fourier transform with its application.

   c) Discuss Voltera model.

   d) Explain the mean & standard deviation of a binomial random variable.

2. a) Find the inverse Laplace transform of :

   (i) $\cot^{-1}(s/a)$

   (ii) $\log\left[\frac{s(s+1)}{s^2+4}\right]$

   b) Find the Laplace transform of (i) $e^{-3t}\,u(t-2)$ (ii) $f(t)=\left(\frac{t}{T}\right)f$ or $0 \le t \le T$, where T is period of the saw-toothed wave function.

3. a) Find the inverse Z-transform of :

   (i) $\left(\frac{z}{z^2+7z+10}\right)$

   (ii) $\left(\frac{z^2+z}{(z-1)^2}\right)$

   b) Find the Z-transform of :

   (i) $\left(\frac{1}{n(n+1)}\right)$

   (ii) $na^n u(n)$

4. a) Discuss structure of trajectory near an equilibrium point.

   b) Discrete convolution & correlation with an example.

5. Explain in brief :

   a) Limit cycles

   b) Vander Pol equation

   c) The binomial distributions

   d) Two dimensional FFT

6. a) Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six?

   b) The probability that a bomb dropped from a plane will strike the target is 1/5. If six bombs are dropped, find the probability that :

      (i) Exactly two will strike the target

      (ii) At least two will strike the target.

7. a) Find the fourier cosine transform of e^{-x^2}.

   b) Explain Discrete random variables.

8. Prove that the nonlinear system :

$$\left[\frac{du}{dt}\right]=u(v-1), \left[\frac{dv}{dt}\right]=4-u^2-v^2, \text{ has four equilibria : } (0, \pm 2) \text{ and } (\pm\sqrt{3}, 1)$$

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.