Roll No .....

MCSE/MSE - 101

M.E./M.Tech., I Semester

Examination, December 2015

Advanced Computational Mathematics

Time : Three Hours *Maximum Marks : 70*

Note : i) Attempt any five questions out of Eight.
ii) All questions carry equal marks.

1. a) Prove that a non-empty subset W of V is a subspace of a vector space V(F), if and only if for each pair of vectors u, v∈ W, and each scalar a∈ F, the vector au+v∈ W.
   b) Prove that
   i) erf (0) = 0 ii) erf (∞) = 1

2. a) Use the method of separation of variables to solve the equation :

$$\frac{\partial^2 V}{\partial x^2} = \frac{\partial V}{\partial t}$$

Given that V = 0 when t → ∞, as well as, V = 0 at $x = 0$ and $x = l$.
   b) Find the Fourier sine and cosine transform of $f(x) = e^{-ax}$.

3. a) Drive the mean and variance of Binomial Distribution.
   b) Two defective tubes get mixed up with two good ones. The tubes are tested, one by one, until both defectives are found. What is the probability that the last defective tube is obtained on :
   i) The second test
   ii) The third test and
   iii) The fourth test?

4. a) Define Mean, Autocorrelation, Autocovariance, Correlation coefficient, Cross correlation of a stochastic process.
   b) A fair dice is tossed repeatedly. If X_n denotes the maximum of the numbers occuring in the first n tosses, find the transition probability matrix P of the Markov chain $\{X_n\}$. Find also P^2 and $P(X_2 = 6)$.

5. a) What is the truth value of the negation of a proposition, truth value of the conjunction of two prepositions, truth value of the disjunction of two prepositions in Fuzzy logic. Explain with examples.
   b) What is MATLAB? Explain the tools which are used in MATLAB. How graph is plotted in 2D in MATLAB?

6. a) Show that the function $T:R^2 \to R^3$ given by $T(x_1, x_2) = (x_1 - x_2, 2x_2 - x_1, -x_1)$ is a linear transformation.
   b) Define vector space and linear transformation, error function and Heaviside's unit function.

7. a) Explain Probability, compound probability, random variable and discrete random variable with suitable example.
   b) What is sampling distribution, estimation and test of hypothesis? Write the procedure for testing of hypothesis.

8. a) Explain Wavelet transform, Haar transform and Queuing theory.
   b) Explain M/M/1 : infinity/inifinity/ FCFS) queuing model.

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