Total No. of Questions :8] *[Total No. of Printed Pages : 2*

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MEPE/MEDC/MEHP/MEMT/MEIC/ MEPS/MTPS/MEVD-101

M.E./M.Tech. I Semester

Examination, December 2016

Advanced Mathematics

Time : Three Hours ***Maximum Marks: 70***

Note : Attempt any five questions. All questions carry equal marks.

1. a) By using method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial y} + u, u(x,0) = 4e^{-3x}$.

   b) Define Wavelet and Haar transforms. Discuss briefly their applications.

2. a) Solve the equation $\frac{\partial^2 u}{\partial t^2} = 16\frac{\partial^2 u}{\partial x^2}$ taking $h = 1$ up to $t = 1.25$ under the conditions $u(0, t) = u(5, t) = 0$ $u_t(x, 0) = 0$ and $u(x, 0) = x^2(5 - x)$

   b) Solve the boundary value problem $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ under the conditions $u(0, t) = u(1, t) = 0$ and $u(x, 0) = \sin \pi x$, $0 \le x \le 1$ using Schmidt method, taking $h = 0.2$ and $k = 0.02$.

3. a) The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$ respectively. Find the probability of two successes. Also, find $P(X \ge 2)$ and $P(X \le 3)$.

   b) A can hit a target 4 times in 5 shots; B 3 times in 4 shots; C twice in 3 shots. They fire a volley. What is the probability that at least two shots hit?

4. a) Find the mean and variance of the Poisson distribution.
   b) Write a short note on concept of estimation theory. What do you mean by point estimate and interval estimate?

5. a) What is queuing problem? Explain some basic characteristic of a queuing system.
   b) In a service department manned by one server, on an average one customer arrives every 10 minutes. It has been found out that each customer requires 6 minutes to be served. Find
      i) Average queue length
      ii) Average time spent in the system
      iii) The probability that there would be two customers in the queue

6. a) What do you mean by a Markov chain? Give suitable examples. Also, discuss the fundamental properties of Markov chain.
   b) Define the followings terms giving examples:
      i) Support of fuzzy set
      ii) Complement of a fuzzy set
      iii) Union of fuzzy set

7. a) What is MATLAB programming? Write its features.
   b) Discuss different types of windows in MATLAB with example of each.

8. a) Define reliability and explain its importance.
   b) Write a short note on the followings:
      i) Goal programming
      ii) Decision theory
      iii) Maintenance and reliability

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