Roll No.....

MTDE/MTEI/MEDI-101

M.E./M.Tech. I Semester

Examination, June 2017

Advanced Mathematics

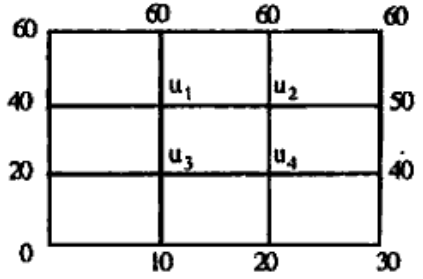
Time : Three Hours

Maximum Marks : 70

Note: i) Answer any five questions.
ii) All questions carry equal marks.

1. a) Solve $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$ by method of separation of variables.

   b) Solve the elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square mesh with boundary values as shown in figure



2. a) Determine the DFT of the sequence

$$x(n) = \begin{cases} \frac{1}{4}, & 0 \le n \le 2 \\ 0 & otherwise \end{cases}$$

   b) Write a note on the following
      i) Wavelet transform
      ii) Haar transform

3. a) Find the mean and variance of Binomial distribution.

   b) In a precision bombing attack there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bumbs must be dropped to give a 99% chance or better of completely destroying the target?

4. a) Draw the transition graph for the Markov chain with the following transition probability matrix

$$\begin{bmatrix} 0.6 & 0.3 & 0.1 \\ 0.8 & 0.2 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

   b) Define Markov chain distinguish between discrete parameter Markov chain and continuous parameter Markov chain.

5. a) In a railway Marshalling yard, good trains arrive at a rate of 30 trains per day. Assuming that inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes calculate the following
      i) The mean queue size (line length) and
      ii) The probability that queue size exceeds 10. If the input of trains increases to an average 33 per day what will be the chance in (i) and (ii)?

b) Explain {(M/M/1): (∞/FCFS)} queuing model and obtain the steady state equations.

6. a) Explain the following

   i) Theory of estimation

   ii) Theory of hypothesis

   b) Six coins are tossed 6400 times using poison distribution. Find the approximate probability of getting 6 heads x times and 2 times.

7. a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 y}{\partial y^2}=0$ inside the square bounded by the line $x=0, x=4, y=0, y=4$ given that $u=x^2 y^2$ on boundary.

   b) Define stochastic process with examples.

8. a) Find the Fourier sine transform of $\left(\frac{e^{-ax}}{x}\right)$

   b) 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.

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