3. a) Let A, B be fuzzy sets defined on a universal set X. Prove that:

i) $(A \cap B)^C = A^C \cup B^C$

ii) $|A| + |B| = |A \cup B| + |A \cap B|$

b) Define fuzzy numbers and arithmetic operations on fuzzy numbers giving examples.

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Roll No .....

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

M.E/M.Tech., I Semester

Examination, December 2014

Advanced Mathematics

Time : Three Hours

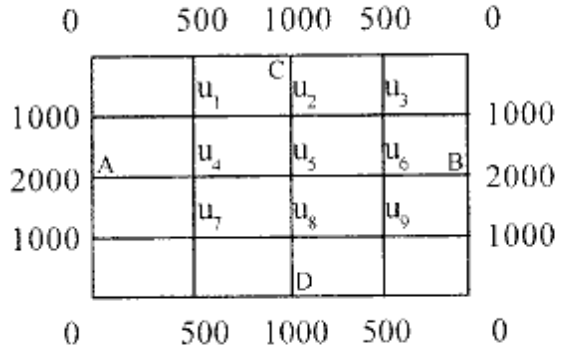
Maximum Marks : 70

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

1. a) A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $u = u_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from the rest from this position, find the displacement $u(x, t)$.

b) Define Wavelet and Haar transforms.

2. a) Solve the equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values:



b) Define the following terms:

i) Morkov chain

ii) Transient and steady state

3. a) If two normal universes have the same total frequency but the standard deviation of one is K times that of other. Show that the maximum frequency of the first is (1/k) times that of other.

b) Discuss the failure rate of a component and find mean time to failure.

4. a) A and B take turns in throwing two dice, the first to throw 10 being awarded the prize. Show that if A has the first throw, their chances of winning are in the ratio 12:11.

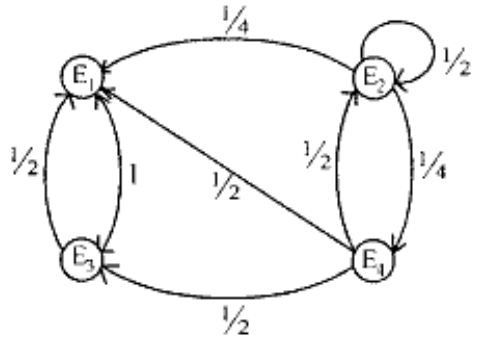
b) What are time dependent Hazard models? Find linear Hazard model and Non linear Hazard model.

5. a) A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately poisson with an average rate of 10 per 8-hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

b) Find the mean deviation from mean for normal distribution.

6. a) Obtain steady state equation for the queuing model (M/M/1) : (N/FCFS).

b) Find the transition matrix to the following transition diagram:



7. a) If for a period of 2 hours in a day (8-10 am) trains arrive at the yard every 20 minutes but the service time continues to remain 36 minutes then calculate for this period:

i) The probability that the yard is empty.

ii) Average queue length, on the assumption that the line capacity of the yard is limited to 4 trains only.

b) Define fuzzy equivalence relation and max-min composition of fuzzy relations giving examples.