MEPE/MEIC/MEDC/MEMT/MEPS/MEVD–101

M. E./M. Tech. (First Semester)
EXAMINATION, June 2013

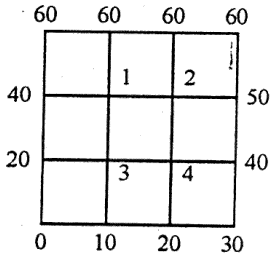
ADVANCED MATHEMATICS

Time : Three Hours

Maximum Marks :

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

1. (a) Using central difference approximation solve $\nabla^2 u = 0$, the nodal poi of the square grid of fig using the boundary values indicated



(b) Find the Fourier transform of :

$$f(x) = \begin{cases} 1 - x_2 & , \ |x| \le 1 \\ 0 & , \ |x| > 0 \end{cases}$$

---

2. (a) Find the values of $u(x, t)$ satisfying the parabolic equa $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$, and the boundary condition

$u(0, t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{1}{2}x^2$ at the points

$x = i$; $i = 0, 1, 2, \ldots, 8$ and $t = \left(\frac{1}{8}\right)j$; $j = 0, 1, \ldots, 5$.

(b) Find the Fourier sine transform of $e^{-|x|}$.

3. (a) In a sample of 600 men from a certain city, 450 are found smoke another sample of 900 men from another city, 450 are smokers. D data indicate that the cities are significantly different with respe the habit of smoking among men ?

(b) The following data are the number of seeds germinating out of 1 damp filter paper for 80 sets of seeds fit a binomial distributic these data :

x :	0	1	2	3	4	5	6	7	8	9	10
f :	6	20	28	12	8	6	0	0	0	0	0

4. (a) Assuming that the diameter of 1000 brass plugs taken consecut from a machine, from a normal distribution with mean 0·7515 cm standard deviation 0.0020 cm. How many of the plugs are likely t rejected if the approved diameter is 0.752 ± 0.004 cm ?

(b) Define samping and standard error. Describe level of significance confidence limits.

5. (a) Explain the following :

(i) The System diferential difference equations.

(ii) System of steady state equations.

In single server with finite capacity queuing system.

(b) In a railway marshalling yard, goods trains arrive at a rate of 30 t per day. Assuming that the inter-arrival time follows an expone distribution and the service time distribution is also exponential an average 36 minutes. Calculate the following :

(i) The mean queue size, and

(ii) The probability that the queue size exceeds 10.

If the input of trains increases to an average 33 per day. What wi the range in (i) and (ii) ?

6. (a) Let A, B be fuzzy sets defined on a universal set x. Prove that

$$|A| + |B| = |A \cup B| + |A \cap B|.$$

(b) How fuzzy tool box works ? Explain different functions which MAT provides in fuzzy tool box.

7. (a) Define mean time to failure and constant Hazard model. Find r time to failure in constant Hazard model.

(b) A component has a reliability function given by

$$R(t) = 1 - \frac{t^2}{a^2} \text{ for } 0 \le t \le a.$$

Where a is a parameter of the distribution representing the components maximum life. Then find :

(i) Probability density function

(ii) Mean time to failure

(iii) Average failure rate

(iv) Average failure rate up to MTTF.

8. Write short notes on any five of the following :

(a) Reliability

(b) Decision theory

(c) Fault tolerant analysis

(d) Mother wavelet

(e) Discrete fourier transform

(f) Markov chain

(g) Goal programming.