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MEPE/MEIC/MEDC/MEHP/ MEMT/MEPS/MEVD–101

M. E./M. Tech. (First Semester)

EXAMINATION, Feb./March, 2009

ADVANCED MATHEMATICS

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

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

1. (a) Define geometrical type curves from the second order partial differential equation in two independent variables x, y. Give their physical examples. Find the solution of the equation :

$$\nabla^2 u = -10(x^2 + y^2 + 10)$$

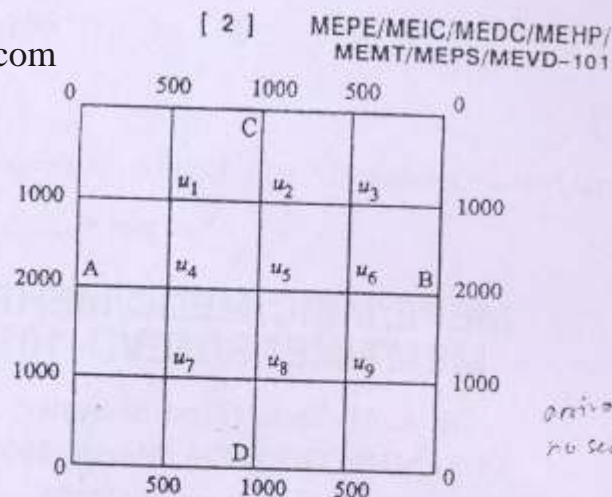over the square mesh with sides $x = 0, y = 0$, $x = 3, y = 3$ with $u = 0$ on the boundary and mesh length $= 1$.

(b) Find the solution of the one-dimensional heat equation by variable separable method.

2. (a) Find Fourier sine transform of :

$$\frac{e^{-ax}}{x}$$

(b) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the ahead square mesh with boundary values as shown :

P. T. O.

9

arrival,
no seat

3. (a) If the variance of the Poisson distribution is 2, find the probabilities for $r = 1, 2, 3, 4$ from the recurrence relation of the Poisson distribution. Also find $P(x \geq 4)$.

(b) In a bombing action, there is 50% chance that any bomb will strike the target. Two direct hits are needed to destroy the target completely. How many bombs are required to be dropped to give a 99% chance or better of completely destroying the target ?

4. (a) Explain the Goal programming model formulation and state the difference between linear programming and Goal programming.

(b) Obtain the steady state difference equation for the queuing model $\{(M/M/1) : (N/FCFS)\}$ and show that :

$$P_n = \frac{(1-\rho)}{1-\rho^{N+1}} \rho^n; \quad 0 \leq n \leq N$$

5. (a) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution

and the service time distribution is also exponential an average of 36 minutes, calculate :

(i) expected queue size (line length)

(ii) probability that the queue size exceeds 10.

(b) "The Markov chain method analyses the curre behaviour of a process and relates the existi characters to the future." Describe this statement taking an example from functional area of marketin

6. (a) Show that the following operation on fuzzy sets satis De Morgan's laws : .

$$U_{max}, I_{min}, C(a) = (1-a)$$

(b) How Fuzzy tool box works ? Explain differe functions which MATLAB provides in Fuzzy tool bo

7. (a) What are the three primary windows in MATLAB an write their purpose.

(b) Write the MATLAB statements required to calcula $y(t)$ from the equation :

$$y(t) = \begin{cases} -3t^2 + 5, & t >= 0 \\ 5t + 2, & t < 0 \end{cases}$$

for values of t between -9 and 9 in step of 0.5.

8. Write short notes on any *four* of the following :

(i) Mother wavelet

(ii) Discrete Fourier transform

(iii) Reliability

(iv) Fault tolerant analysis

(v) Decision theory

(vi) Sampling distribution

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