Total No. of Questions :8] *[Total No. of Printed Pages :4*

Roll No .....

MMIS-101

M.E/M.Tech. I Semester

Examination, June 2017

Advanced Mathematics and Statistics

Time : Three Hours

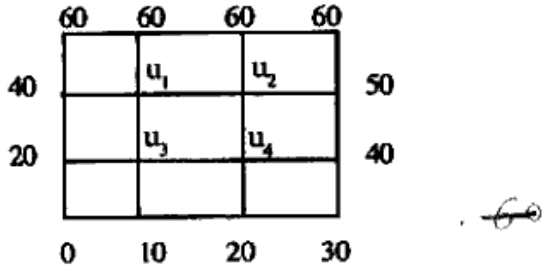
Maximum Marks : 70

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

1. a) Solve : $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ by the method of separation of variables, given that u = 0 when $t = \infty$, as well as u = 0 at $x = 0$ and $x = 1$.

   b) State and prove Modulation Theorem for complex Fourier transform.

2. a) 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 are given in figure below:



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

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

$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

   b) The state transition matrix for retentions, gains and losses of firms A, B and C is given below. Using this matrix determine the steady state equilibrium conditions:

From	To A	To B	To C
A	0.700	0.100	0.200
B	0.100	0.800	0.100
C	0.200	0.100	0.700

4. a) Define following:
   i) The input or arrival pattern.
   ii) Queue discipline

   b) Define Model - I: [M/ M/ 1 :(∞/∞/ FCFS)]
   (Single Sever - infinite population)

Contd...

5. a) If the probability density function of the random variable x is given by :

$$f(x)=\begin{cases}\frac{1}{3}, & -1<x<2\\ 0, & \text{otherwise}\end{cases}$$

then find its m.g.f.

b) Assuming that half the population are consumers of chocolate so that the chance of an individual being a consumer is $\frac{1}{2}$ and assuming that 100 investigators each take 10 individuals to see whether they are consumers how many investigators, whould you expect to report that three people or less were consumers.

6. a) Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six.

b) The mortality rate for a certain disease is 7 in 1000. What is the probability for just 2 deaths on account of this disease in a group of 400? Given $e^{-2.8} = 0.06$.

7. a) Fit a second degree parabola to the data given below:

x :	0.5	1.0	1.5	2.0	2.5	3.0	3.5
y :	2	6	12	20	30	42	56

b) Calculate Karl Pearson's correlation coefficient between X and Y using short cut method:

X :	2	5	7	9	19	17
Y :	25	27	26	29	34	35

a) Define is reliability and its basic elements.

b) Define followings for reliability.

i) Redundancy

ii) Maintenance

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