b) Use Galerkin's method to solve the equation :

$$\frac{d^2y}{dx^2} - y + x = 0, \quad y(0) = y(1) = 0.$$ 7

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Roll No .....

MMTP/MMCM/MMIE/MMMD/MMPD-101

M.E./M.Tech., I Semester

Examination, December 2015

Advance Mathematics

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.

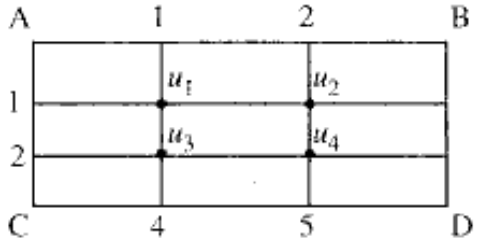
ii) All questions carry equal marks.

1. a) Examine whether the set of vectors (2,3,–1), (–1,4,–2) and (1,18,–4) is linearly dependent or not in the vector space V_3 of real numbers R. 7

b) Give the mathematical definition and pictorial representation of unit step Heaviside function. Also give engineering application of this function. 7

2. a) A tightly stretched string with fixed end points $x = 0$, and $x = l$ is initially in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position, find the displacement. 7

b) Solve the elliptic equation $U_{xx} + U_{yy} = 0$ for the following square mesh with boundary values as shown in the figure. 7



3. a) The following data are the numbers of seeds germinating out of 10 on damp filter for 80 sets of seeds. Fit a binomial distribution to these data : 7

x :	0	1	2	3	4	5	6	7	8	9	10	Total
f :	6	20	28	12	8	6	0	0	0	0	0	80

b) Find the mean and variance of Poisson distribution. 7

4. a) Define stochastic process and explain classification of stochastic process. 7

b) In a service department manned by one server, on an average one customer arrives every 10 minutes. It has been found out that each customer requires 6 minutes to be served. 7

Find out :

i) Average Queue Length

ii) Average time spent in the system

iii) The probability that there would be two customer in the queue.

5. a) What do you understand by Queue? Give some important application of Queuing theory? 7

b) Determine whether the given transition matrix is ergodic Markov Chain : 7

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 1/3 & 1/3 & 0 & 1/3 \\ 0 & 1/2 & 1/4 & 1/4 \\ 1/4 & 0 & 1/2 & 1/4 \\ 0 & 0 & 1/3 & 2/3 \end{bmatrix} \end{array}$$

6. a) Define Hermite polynomial and write its differential equation. 7

b) Prove that the set $G = \{1,5,7,11\}$ constitutes a group under multiplication modulo 12 as the composition in G. 7

7. a) Explain the meaning and importance of sampling distribution. 7

b) Find the Fourier transform of $f(x) = \begin{cases} x & , |x| \le a \\ 0 & , |x| > a \end{cases}$. 7

8. a) Find the path on which a particle in the absence of friction, will slide from one point to another in the shortest time under the action of gravity. 7