Roll No..

MCSE/MSE-101

### M.E./M.Tech., I Semester Examination, June 2020
Advanced Computational Mathematics

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Show that the set $W = \{ (a,b, 0) /a,b \in F\}$ is a subspace of $V_3(F)$.

   b) Find whether the set of vectors $V_1 = (1, 2, 1)$; $V_2 = (3,1, 5)$ and $V_3 = (3, -4, 7)$ is linearly independent or dependent.

2. a) Show that the vectors $(2, 1, 4), (1, -1, 2), (3, 1, -2)$ form a basis for R^3.

   b) If $f : V_3(F) \rightarrow V_2(F)$ is defined on $f(x, y, z) = (y, z)$ then show that f is a linear.

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

4. Solve the elliptic equation $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ for the square mesh with boundary values as shown in figure.
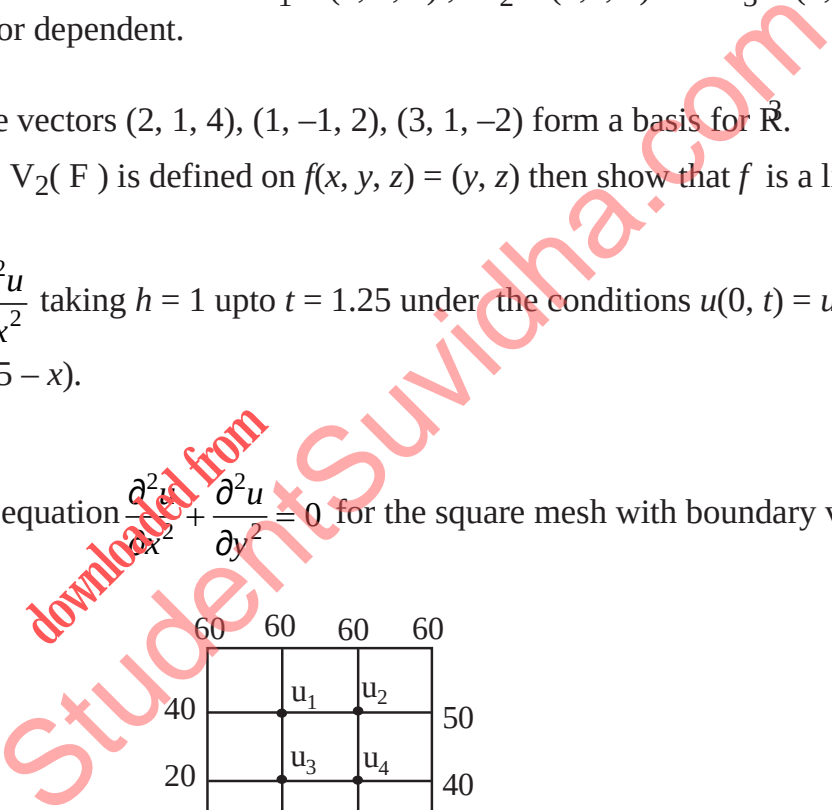
5. a) If the function $f(x)$ is defined by $f(x) = ce^{-x}, 0 \leq n \leq \infty$ find the value of C for which $f(x)$ becomes probability density function.

   b) Write a short note on probability distribution.

6. a) The mean and variance of a binomial distribution are 4 and 4/3 respectively. Find:
      i) the probability of 2 success
      ii) the probability of more than 2 success.

   b) Find mean and variance of Poisson distribution.

7. a) What do you understand by Markov process? In what areas of management can it be applied successfully?

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

   $$P_n = \frac{(1-\rho)}{1-\rho^{N+1}} P^n, \, 0 \le n \le N$$

8. a) What are the three primary windows in MATLAB and write their purpose?
   b) Define fuzzy relations. Discuss fuzzy if then rules with some examples.

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