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MCSE/MSE-101

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

Examination, November 2019

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 mapping $f : V_3(R) \rightarrow V_2(R)$, defined by $f(a, b, c) = f(a, b)$ is linear transformation. What is the kernel of this transformation?

   b) Examine whether the system of vectors $q_1 = (1,2,3)$; $q_2 = (1,0,1)$ and $q_3 = (0,1,0)$ are linearly dependent or not.

2. a) Prove that Hermit Polynomial

   $$H_n(x) = (-1)^n e^{x^2} \frac{d^n}{dx^n}\left(e^{-x^2}\right)$$

   b) Define Heaviside unit step function. Using this find

   $$L\left(t^3 - rt + 5 + 3\sin 2t\right)$$

3. a) Solve the Poisson's Equation:

   $u_{xx} + u_{yy} = -10\left(x^2 + 4^2 + 10\right)$ over the square with sides $x = 0, y = 0, x = y = 3$ with $u = 0$ on the boundary and mesh length 1.

   b) Define following

   i) FT   ii) DFT

4. a) Using separation of variable technique to solve

   $3u_x + 2u_y = 0$ with $u(x,0) = 4e^{-x}$.

   b) Find the mean and variance of Binomial distribution.

5. a) For the Normal Curve $y = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-m)^2/2\sigma^2}$

   find the mean and standard deviation.

   b) Fit a Poisson's distribution to the following calculate theoretical frequencies

x :	0	1	2	3	4
f :	122	60	15	2	1

6. a) Obtain the steady state difference equation for the queueing model (M/M/1 : N/FCFS) in usual notation and solve them for p_0 and p_1.

   b) Define Stochastic Process and explain classification of stochastic process.

7. a) Obtain the distribution of the number in the system in steady state for M/M/S model by considering it as a birth and death process.

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

8. a) Define Fuzzy set, If:

$A=\{(1,0.2),\ (2,0.5),(3,0.8),(4,1),(5,0.7),(6,0.3)\}$

be a Fuzzy set, then find the α- cut for $\alpha = 0.2, 0.5, 0.8, 1$ and strong α- cut for $\alpha = 0.8$.

b) What are the three primary windows in MATLAB and write their purpose?

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