MCSE/MSE (N)–101

M. E./M. Tech. (First Semester) EXAMINATION, March, 2010

ADVANCED COMPUTATIONAL MATHEMATICS

Time : Three Hours

Maximum Marks : 100

Note : Attempt *five* question in all. One question from each Unit is compulsory. All questions carry equal marks.

Unit–I

1. Let F be a subfield of complex numbers and let T be the function from F^3 to F^3 defined by

$$T(x_1, x_2, x_3) = (x_1 - x_2 + 2x_3, 2x_1 + x_2, + x_1 - 2x_2 + 2x_3).$$

(a) Verify that T is a linear transformation.

(b) If (a, b, c) is a vector in $\mathbf{F}^3$, what are the conditions on a, b and c that the vector be in the range on T ? What is the rank of T ?

(c) What are the conditions on a, b and c than (a, b, c) be in the null space of T ? What is the nulity of 1 ?

Or

2. Define Hash function with examine and write the Ha rmian differential equation and Mathematician form of Mean value polynomial. Check whether the following function of a $\mathbf{R}^2$ into $\mathbf{R}^2$ are when transfer is on is not :

(a) $T(x_1, x_2) = (1 + x_1, x_2)$ (b) $T(x_1, x_2) = (x_2, x_1)$

(c) $T(x_1, x_2) = (x_1, x_2)$ (d) $T(x_1, x_2) = (\sin x_1, x_2)$

(d) $T(x_1, x_2) = (x_1 - x_2, 0)$.

Unit–II

3. The logitudinal displacement in a vibrating elastic but can be described by the boundary value problem :

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}, \qquad 0 < x < l,\ t > 0;$$

$$\frac{\partial u}{\partial x}(0, t) = 0,$$

$$\frac{\partial u}{\partial x}(l, t) = 0, \quad t > 0$$

$$u(x, 0) = x^2 (1 - \sin x),$$

$$\frac{\partial u}{\partial t}(x, 0) = 0, \quad 0 < x < l.$$

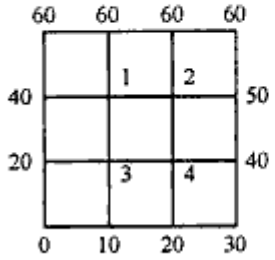
Find the solution of the above boundary value problems by using method of separation of variables.

Or

4. (a) Explain the following with one example in each case where it is applied :

(i) DFT (ii) WFT.

(b) Solve Laplace equation at mesh points :



with given condtions.

Unit III

5. Define discrete and continuous random variables. Let X have the density function :

$$f(x) = 0.75\,(1 - x^2), \quad \text{if } -1 \le x \le 1$$
$$= 0 \quad \text{otherwise.}$$

Find the distribution function. Find the probabilities $P\left(-\frac{1}{2} < x \le \frac{1}{2}\right)$ and $P\left(\frac{1}{4} \le x \le 2\right)$. Find x s.t.

$$P(X \le x) = 0.95.$$

Also compute the probability of obtainin at least two is in rolling a fair di 4 times.

Or

6. Define null and alternative hypothesis. Define confidence interval.

If the probability of producing a defective screw is $p = 0.01$, what is th probability that a lot of 100 screws will contain more than 2 defectives ?

Unit–IV

7. Distinguish between discrete parameter Markov chain and continuou parameter Markov chain. A man either drives his car or takes a train t work each day. Suppose he cover takes the train two days in a row, but he drives to takes, then the next day he is just likely to drive again as h is to take the train. Find the trainsion matrix. Also find the probability tha he changes from going by train to driving exactly in four days.

Or

8. A one-person barber shop has six chairs to accomdance people waiting f haircut. Assume customer was arrive when all six chairs are full lea without entering the barber shop. Customer's arrive at the average rate 3 per hour and spend an average of 15 minutes in the barber shop. The find ?

(a) The probabilities a customer can get directly into the barber chair upon arrival.

(b) Expected number of customer waiting for a hair cut.

(c) Effective arrival rate.

(d) The time a customer can expect in spend in the barber shop.

Unit–V

9. (a) What is fuzzy membership function ? Explain the triangular, trapezoidal and Gaussian membership function with their mathematical form.

(b) Explain different defuzzification methods.

Or

10. Explain various features of MATLAB in detail. Give *five* applications where it is used.

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