B.Tech. Degree III Semester Examination in Marine Engineering, December 2008

MRE 301 ENGINEERING MATHEMATICS III

Time: 3 Hours   Maximum Marks: 100

I   a)   Derive the sampling distribution of the variance of samples taken from a
          normal population   (10)

     b)   A random sample is taken from a normal population with mean 30 and S.D. 4.
          How large a sample should be taken if the sample mean is to lie between 25
          and 35 with probability 0.98?   (10)

OR

II   a)   Fit a parabola $y = ax^2 + bx + c$ by the method of least square to the following data.   (10)

x	:	10	12	15	23	20
y	:	14	17	23	25	21

     b)   In a partially destroyed laboratory records of an analysis of a correlation data, the
          following results are available. Variance of x is 9 and regression equations are:
          $8x - 10y + 66 = 0$, $40x - 18y = 214$. Find (i) the mean value of x and y
          (ii) Standard deviation of y   (iii) the coefficient of correlation between x and y.   (10)

III a)   Explain error detection and correction codes with examples.   (10)

     b)   Implement "Exclusive – OR" gate using universal gates.   (10)

OR

IV   a)   Explain any two binary representation of integers.   (10)

     b)   Convert the following Boolean expression, to sum of product:

$$\left(A + B + C\right)\left(A + \bar{B} + C\right)\left(\bar{A} + B + \bar{C}\right)$$ (10)

V   Prove that: (a) $\Delta = \dfrac{1}{2}\delta^2 + \delta\sqrt{1 + \dfrac{\delta^2}{4}}$ (7)

(b) $\Delta + \nabla = \dfrac{\Delta}{\nabla} - \dfrac{\nabla}{\Delta} = 2\mu\delta$ (9)

(c) Evaluate $\left(E^{-1}\Delta\right)x^3$ (4)

OR

VI   Solve the difference equation:

a) $y_{n+2} + 6y_{n+1} + 9y_n = 2^n, y_o = y_1 = 0$ (7)

,b) $y_{n+2} - 4y_n = n^2 + n - 1$ (7)

c) $y_{n+2} + y_n = \cos\dfrac{n}{2}$ (6)

VII   a)   Find the polynomial f(x) using Newton's divided difference formula from the following data:

x	:	4	5	7	10	11	13
f(x)	:	48	100	294	900	1210	2028

(10)

b)   Using Lagranges formula find $f(4)$, given $f(2) = 1.5713$, $f(3) = 1.5719$, $f(5) = 1.5738$ and $f(6) = 1.5751$.   (10)

OR

VIII   a)   Find the values of $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at $x = 1.2$ and $x = 2.8$ from the table below.

x	:	1.0	1.5	2.0	2.5	3.0
y	:	27.00	106.75	324.0	783.75	1621.0

(10)

b)   Evaluate $\displaystyle\int_{0}^{1} \dfrac{dx}{1+x^2}$ by trapezoidal rule and Simpson's $\dfrac{1}{3}$ rule.   (10)

IX   a)   Design an algorithm to find the value of Sin x correct to 5 decimal places.   (10)

b)   Explain Bubble Sort algorithm and find the computational complexity of it.   (10)

OR .

X   a)   Design an efficient algorithm to find the exponent: a^n, where **a** is a fractional number and n is an integer.   (10)

b)   Explain linear search problem and evaluate its computational complexity.   (10)

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