

**B.Tech. Degree III Semester Examination in Marine Engineering  
December 2012**

**MRE 301 ENGINEERING MATHEMATICS III**

Time: 3 Hours

Maximum Marks: 100

- I. (a) Distinguish between a statistic and a parameter. What do you mean by the sampling distribution of a statistic? (8)
- (b) A random sample of size 100 is taken from an infinite population having mean  $\mu = 76$  and variance  $\sigma^2 = 256$ . (12)
- (i) Write down the sampling distribution of the sample mean  $\bar{x}$ .
- (ii) What is the standard error of the sampling distribution of  $\bar{x}$ ?
- (iii) Find  $P(75 < \bar{x} < 78)$ .

**OR**

- II. (a) Fit a parabola  $y = ax^2 + bx + c$  by the method of least squares. (10)
- $x$ : 10 12 15 23 20
- $y$ : 14 17 23 25 21
- (b) Explain why there are two regression lines for a given data. (10)
- The following details are given.
- $\sum x = 544, \sum y = 552, \sum x^2 = 37028$
- $\sum y^2 = 38132, \sum xy = 37560, n = 8$
- Obtain the regression line of  $y$  on  $x$  and estimate  $y$  when  $x$  is given as 68.

- III. (a) Explain error detection and correction codes with examples. (8)
- (b) Prove that (6)
- $$AB + \bar{A}C + BC = AB + \bar{A}C$$
- (c) Find the complement of  $A\bar{B} + AC + \bar{B}C$ . (6)

**OR**

- IV. (a) Define NAND and NOR gates. Explain their universality. (8)
- (b) Convert the Boolean expression to 'sum of product'. (6)
- $$(A + B + C)(A + \bar{B} + C)(\bar{A} + B + \bar{C})$$
- (c) Simplify the Boolean expression (6)
- $$A + B(A + B) + A(\bar{A} + B).$$

**(P.T.O.)**

V. (a) With usual notations, prove (10)

$$(i) \quad \Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = 2\mu\delta$$

$$(ii) \quad 1 + \delta^2\mu^2 = \left(1 + \frac{1}{2}\delta^2\right)^2$$

(b) Solve the difference equations (10)

$$(i) \quad y_{n+2} - 4y_{D+1} + 3y_n = 5^n$$

$$(ii) \quad y_{n+2} - 4y_n = n^2 + n - 1$$

**OR**

VI. (a) Evaluate: (10)

$$(i) \quad (E^{-1}\Delta)x^3$$

$$(ii) \quad \Delta^n(e^x)$$

(b) A light elastic string stretched between two fixed nails 120cms apart, carries 11 loads of weight 5gm each at equal intervals and the resulting tension is 500 gm/wt. Show that the sag at the mid-point is 1.8 cm. (10)

VII. (a) Using Newton's backward formula find  $\tan(0.26)$ , given (10)

$$x : 0.10 \quad 0.15 \quad 0.20 \quad 0.25 \quad 0.30$$

$$\tan x : 0.1003 \quad 0.1511 \quad 0.2027 \quad 0.2523 \quad 0.3093$$

(b) Find an approximate value of  $\log_e^5$  to four decimal places by Simpson's one-third rule, (10)

evaluating the integral  $\int_0^5 \frac{dx}{4x+5}$ , dividing the range into 10 equal parts.

**OR**

VIII. (a) Using Newton's divided difference formula find a cubic polynomial to the following data: (10)

$$\begin{array}{cccc} x & : & 0 & 1 & 3 & 4 \\ f(x) & : & 1 & 4 & 40 & 85 \end{array}$$

(b) The following table gives the velocity of a body during the time  $t$  specified. (10)

$$t : 1.0 \quad 1.1 \quad 1.2 \quad 1.3 \quad 1.4$$

$$v : 43.1 \quad 47.7 \quad 52.1 \quad 56.4 \quad 60.8$$

Find the acceleration at  $t = 1.1$ .

IX. (a) Write an algorithm to find the Fibonacci series. (10)

(b) Explain bubble sort algorithm and find its computational complexity. (10)

**OR**

X. (a) Design an efficient algorithm to evaluate  $\cos x$ . (10)

(b) Design an algorithm to evaluate the factorial of a positive integer. (10)