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**B.Tech. Degree III Semester Supplementary Examination in  
Marine Engineering December 2020**

**MRE 1301 ENGINEERING MATHEMATICS III  
(2013 Scheme)**

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

I. (a) Define: (5 × 2 = 10)

- (i) Random variable
- (ii) Population and sample
- (iii) Standard error
- (iv) Degree of freedom
- (v) Moments for grouped data

- (b) A bag contains 6 white and 9 black balls. Four balls are drawn at a time. Find the probability for the first draw to give 4 white and the second to give 4 black balls in each of the following cases. (10)
- (i) The balls are not replaced before the second draw.
  - (ii) The balls are replaced before the second draw.

OR

- II. (a) Explain
- (i) Curve fitting and method of least squares. (4)
  - (ii) Regression lines and regression coefficient. (3)
  - (iii) Multiple regression. (3)

- (b) Fit a second degree parabola to the following data: (10)

x	0	1	2	3	4
y	1	5	10	22	38

- III. (a) Find the negative root of the equation  $x^3 - 5x - 7 = 0$  that lies between 2 and 3, correct to 4 decimal places, using method of false position. (10)
- (b) Find the root of the equation  $e^x = 2x + 1$ , correct to 4 decimal places using Newton-Raphson method. The root lies between 1 and 2. (10)

OR

- IV. (a) Explain about: (10)
- (i) Error detecting codes
  - (ii) Error correcting codes
  - (iii) Alpha numeric codes
  - (iv) Boolean algebra with axioms.

- (b) State and prove De Morgan's theorem in both form. (10)

(P.T.O.)

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V. (a) Prove that:

$$(i) \quad \mu\delta = \frac{1}{2}\Delta E^{-1} + \frac{1}{2}\Delta \quad (6)$$

$$(ii) \quad \delta = 2\sin\left(\frac{hD}{2}\right) \quad (4)$$

(b) Define and express each of  $\Delta, \nabla$  and  $\delta$  in terms of  $E$ . (10)**OR**

VI. Solve: (20)

$$(i) \quad y_{x+3} - 2y_{x+2} - y_{x+1} + 2y_x = 0$$

$$(ii) \quad y_{n+2} - 4y_{n+1} + 3y_n = 2^n + 3^n + 7$$

$$(iii) \quad y_{x+2} - 6y_{x+1} + 16y_x = 4^x$$

VII. (a) Given  $\sin 45^\circ = 0.7071$ ,  $\sin 50^\circ = 0.7660$ ,  $\sin 55^\circ = 0.8192$ ,  
 $\sin 60^\circ = 0.8660$ . Find  $\sin 52^\circ$  using Newton's forward difference  
 interpolation formula. (10)

(b) For the given values (10)

$x$	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

Compute  $f(9)$  using Newton's divided difference formula.**OR**

VIII. (a) Use Lagrange's interpolation formula to find the value of  $y$  when  $x = 10$  if  
 the values of  $x$  and  $y$  are as given below: (10)

$x$	5	6	9	11
$y$	12	13	14	16

(b) The velocity  $v$  of a particle at a distance  $s$  from a point on its path is given  
 by the table. (10)

$s$ (ft)	0	10	20	30	40	50	60
$v$ (ft/sec)	47	58	64	65	61	52	38

Estimate the time taken to cover 60 ft by using Simpson's rule.

IX. (a) Explain Fibonacci sequence generation. Also write an algorithm to  
 develop the Fibonacci series. (10)

(b) Develop an efficient algorithm to evaluate  $e^x$ . (10)**OR**

X. Explain the following and evaluate its computational complexity. (20)

(i) Linear search problem.

(ii) Merging problem.

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