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

19-208-0301 ENGINEERING MATHEMATICS III
(2019 Scheme)

Time: 3 Hours

Maximum Marks: 60

$(5 \times 15 = 75)$

I. (a) Evaluate $\int_c z^2 \, dz$ where C is the straight line segment joining the origin and 2+3i. (7)

   (b) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin, even if it satisfies Cauchy-Reimann equations at that point. (8)

OR

II. (a) From the integral $\int_c \frac{dz}{z+4}$ show that $\int_0^\pi \frac{1+4\cos\theta}{17+8\cos\theta} \, d\theta = 0,$ where C is the circle $|z| = 1$ (8)

   (b) Find the Laurent series expansion in powers of z of the function (7)
   $$f(z) = \frac{1}{z(1+z^2)}.$$

III. (a) The average male drinks 2 L of water when active outdoors with a standard deviation of 0 .7 L. You are planning a full day nature trip for 50 men and will bring 110 L of water. What is the probability you will run out? (7)

   (b) A population is known to follow the normal distribution with mean 2 and standard deviation 3. Find the probability that the mean of a sample of size 16 taken from this population will be greater than 2.5. (8)

OR

IV. (a) Fit a parabola $y = ax^2 + bx + c$ to the following data. (8)

X	10	12	15	23	20
y	14	17	23	25	21

   (b) Find the regression line of y on x from the following: (7)

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

Also find the value of y when x=7

V. (a) Find a real root of the equation $\cos x - xe^x = 0$ correct to four decimal places by Newton-Raphson method. (7)

   (b) Use Regula Falsi method to solve $x^3 - 4x + 1 = 0$ correct to 3 decimal places. (8)

OR

VI. (a) Use modified Euler's method to find y (1.2) correct to 3 decimal places (8)
   where $\frac{dy}{dx} = 1n(x+y)$ and $y(1) = 2$

   (b) Solve $\frac{dy}{dx} = y + 3e^x$, $y(0) = 1$ correct to 3 decimal places at $x = 0.2$, using Taylors method. (7)

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VII. (a) Prove the following: (8)

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

      (ii) $\quad E = e^{hD}$

      (iii) $\quad \Delta+\nabla = \dfrac{\Delta}{\nabla}-\dfrac{\nabla}{\Delta}$

      (iv) $\quad \Delta-\nabla = \delta^2$

(b) Express $3x^3 - x + 2$ in factorial notation. (7)

OR

VIII. (a) Find a difference equation satisfied by the equation $y = ax^2 - bx$ (5)

(b) Solve the equation $y_{n+4} - 2y_{n+2} + y_n = 0$ (5)

(c) Solve $y_{n+2} + Y_{n+1} + y_n = n^2$ (5)

IX. (a) From the following data, estimate the number of students who obtained marks between 40 and 45. (7)

Marks	30-40	40-50	50-60	60-70	70-80
Numbers of students	31	42	51	35	31

(b) Evaluate f(1.27) using Stirling's interpolation formula from the following: (8)

x	1.0	1.1	1.2	1.3	1.4
F(x)	0.841	0.891	0.932	0.963	0.985

OR

X. (a) Evaluate $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at $x = 2$ from the following: (7)

x	0	1	3	6
y	18	10	-18	40

(b) Evaluate $\displaystyle\int_0^1 \dfrac{1}{1+x^2}dx$ using (8)

      (i) Trapezoidal rule by taking n=5

      (ii) Simpson's rule by taking n=4

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