[2HS306] Applied Engineering Mathematics - Sept-Oct 2021

MCQ [1 mark each]

1. Using Euler's Method, value of $y(0.1)$ from the differential equation $-y' = y,\ y(0) = 2$ with stepsize equal to 0.1 is

   (a) 1.8 ✓ (c) 2.0

   (b) 2.2 (d) None of these

MCQ [2 mark each]

1. If E denotes shift operator, Δ denotes the forward difference operator and ∇ denotes backward difference operator then the value of $\Delta\nabla$ is

   (a) E (c) $\Delta - \nabla$ ✓

   (b) $\Delta - 1$ (d) None of these

2. In which of the following interval the root of equation $f(x) = x^3 - 7x^2 + 6x - 1$ will lie

   (a) $(-1, 0)$ (c) $(1, 2)$

   (b) $(0, 1)$ (d) None of these ✓

3. The approximate close value of $\int_0^{\frac{\pi}{2}} \sqrt{\sin x}$ using Trapezoidal rule with $h = \frac{\pi}{4}$ is

   (a) 0.66044 (c) 0.56412

   (b) 0.76084 (d) 0.60064

4. The approximate close value of $\int_1^2 \sqrt{\sin x + \cos x}$ using appropriate Simpson's rule with $h = 0.25$ correct to 4 decimal places is

   (a) 1.2840 (c) 1.0027

   (b) 1.0582 (d) None of these

5. The iterative formula to compute fourth root of positive number S using Newton–Raphson method is

   (a) $x_{n+1} = \frac{4}{3}x_n + \frac{S}{4x_n^3}$ (c) $x_{n+1} = \frac{4}{3}x_n - \frac{S}{3x_n^3}$

   (b) $x_{n+1} = \frac{3}{4}x_n + \frac{S}{4x_n^3}$ ✓ (d) $x_{n+1} = \frac{3}{4}x_n - \frac{S}{3x_n^3}$

6. The approximate root of $x^3 - 6x + 1 = 0$ correct to two decimal place using Bisection method is

   (a) 0.12 (c) 0.21

   (b) 0.20 (d) 0.16 ✓

7. The solution of $y' = x^2 + 1$ where $y(0) = 0$ upto second approximation using Picard's method is

(a) $\frac{x^7}{63} + 2\frac{x^5}{15} + \frac{x^3}{3}$
(b) $\frac{x^9}{81} + 2\frac{x^5}{15} + \frac{x^3}{3}$
(c) $\frac{x^7}{63} + 2\frac{x^5}{12} + \frac{x^4}{16}$
(d) None of these ✓

SUBJECTIVE QUESTIONS [5 mark each]

1. Using Fourth order Runge-Kutta method find $y(0.2)$ where $y' + 2y = \sin 3x,\ y(0) = 1$ with a step size 0.2.

2. Find value of $f(0.56)$ from the following table using Newton forward interpolation formula.

x	0.5	0.6	0.7	0.8
$f(x)$	1.127626	1.185465	1.225169	1.337435

3. Solve the following system of equations by Gauss–Seidel Method
$5x - y + 2z = 10,\quad 2x + 4y = 12,\quad x + y + 5z = -1.$

****