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Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
Midterm Examination, Fall-2026

Course Code: 0541-223 | Course Title: Numerical Methods
Section: A, B, C, D, E, F, G | Level-Term: L2-T2 | Teacher's Initial: AKB, SP, SHS
Full Marks: 25 | Exam Date: November 02, 2026 | Time: 1.5 Hours

[Answer ALL FOUR Questions given below. The second rightmost column indicates the COs (course learning outcomes of the course) with respective Bloom's level, and the rightmost column indicates the assigned marks.]

Q1. Four rockets must reach the same point simultaneously to intercept an alien spacecraft. Using the given four equations and starting with $x = y = z = t = 0$, **apply** Gauss-Seidal method to approximate the meeting coordinates (x, y, z) and interception time, t after four iterations. The navigation equations are: CO-1 C(3) [7]

$$\text{Rocket 1: } 2x - y + 10z - t = 36$$
$$\text{Rocket 2: } x + 2y - z + 12t = 64$$
$$\text{Rocket 3: } 10x - y + 2z + t = 30$$
$$\text{Rocket 4: } x + 11y - z + 2t = 41$$

Q2. The current passing through an electric device is given by the equation: $I(t) = (t + 1)$, where t is the time in seconds and I is the current in amperes. The voltage across the device is given by: $V(t) = 3t - 21 + \frac{47}{t+1}$. Hence, the power dissipated in the device is: $P(t) = V(t)\,I(t)$. **Apply** the "False Position Method" to determine the time at which the net electrical work done reaches 24 J. Take the initial guesses as $(a = 4)$ s and $(b = 6)$ s. Stop the iterations when the absolute difference between two successive approximations of t is less than 0.05 s. CO-1 C(3) [6]

Q3. A data analytics company records the relationship between server processing time and the number of reports generated, as shown below: CO-1 C(3) [6]

Processing time (minutes)	40	60	90	120
Reports generated	14	20	31	41

The company earns Tk. 30 per report and spends Tk. 12 per minute on processing. **Apply** Lagrange's Interpolation Formula to estimate the number of reports generated in 100 minutes and determine the resulting profit or loss.

Q4. During a quality-assurance test at a solar energy laboratory, the measured output voltages of solar panels are grouped into the intervals shown below: CO-1 C(3) [6]

Output Voltage (V)	35–45	45–55	55–65	65–75	75–85
Number of Solar Panels	20	40	60	60	20

Apply Newton's Forward and Backward Interpolation to estimate the number of solar panels whose output voltage lies between 50 V and 80 V.