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Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Fall – 2025

Course Code: 0541-211
Section: A ,B ,C,D,E,F,G,H
Full Marks: 40

Course Title: Coordinate Geometry and vector analysis
Level-Term: L1-T1
Exam Date: December 24, 2025

Teacher's Initial: IJM,SS
Time: 2 Hours

[The second right most column indicates the Cos with respective Bloom's Level. The right most column indicates the assigned marks]

Q1. **(a) Demonstrate** Directional derivative of a scalar field. CO-2 (C2) **[02]**

(b) Using the cross product , **Recognize** a unit vector perpendicular to the plane of **A=2i-6j-3k** and **B=4i+3j-k.** **[03]**

Q2.

(a) Recognize the direction in which the directional derivative of $\emptyset = x^2z+xy+y^2\ln(1+z)$ *is a maximum* from the point (2, 0, 1). And **identify** the magnitude of the maximum. CO-2 (C2) **[05]**

(b) Identify the constant 'a' so that the following vector field is solenoidal **[03]**

V=(2x−y+4z)i+(−x+3y−2z)j+(5x+2y+az)k.

Q3. **(a)** A Particle moves along a curve whose parametric equations are x=20t, y=21cos(t^2), z=21sin(t^2) , where 't' is the time. **Determine** its velocity and acceleration at any time t. Also find the magnitude of velocity and acceleration at t=1 CO-3 (C3) **[06]**

(b) Calculate the work done by the external force on moving 120C charge from point A (4,3, 2) to B (3,2,1) in the electric field given by **E =4i-3j+2k** **[06]**

Q4. The acceleration of a particle at any time t≥0 is given by CO-3 (C3) **[07]**

$\boldsymbol{a} = 12cos2t\boldsymbol{i} - 8sin2t\boldsymbol{j} + 16t\boldsymbol{k}$. If the velocity **v** and displacement **r** are zero at t=0, **Interpret v** and **r** at any time.

Q5. **(a) Compute** the value of the constant 'a' so that **[04]**

$\boldsymbol{V} = (axy-z^3)\mathbf{i} + (a-2)x^2\boldsymbol{j} + (1-a)xz^2\boldsymbol{k}$ is irrotational. CO-3 (C3)

(b) Suppose $\boldsymbol{A} = \boldsymbol{i} + 2\boldsymbol{j} + 3\boldsymbol{k}$, $\boldsymbol{B} = 3\boldsymbol{i} - \boldsymbol{j} + 2\boldsymbol{k}$, $\boldsymbol{C} = 2\boldsymbol{i} + 4\boldsymbol{j} - \boldsymbol{k}$. **Calculate** the volume of the parallelepiped whose sides are denoted by the three vectors ***A***, ***B*** and ***C***. **[04]**