**Electromagnetic Field Theory**

**Assignment 1 – CLO1**

**Total Marks: 30 Due Date: 20/9/25**

1. What is the BAC-CAB Rule? **(2)**
2. Discuss one phenomenon in detail that cannot be described using circuit theory. **(5)**
3. Discuss the difference between scalar and vector field with an example. (5)
4. Find the dot and cross product of the following vectors: (3)

A = 10ax - 5ay + 3az  , B = 11ax + 6ay -9az

1. **(a)** Give the rectangular coordinates of the point C(p = 4.4, φ= -115, z = 2). **(b)** Give the cylindrical coordinates of the point D(x -3.1, y = 2.6, z = -3). **(c)** Specify the distance from C to D. **(3)**
2. Transform to cylindrical coordinates: **(a)** F = 10ax - 8ay + 6az at point P (10, -8, 6). **(b) G=** (2x+y)ax-(y-4x)ay at point Q(p, φ,z). **(c)** Find the rectangular components of the vector H = 20ap, - 10aφ, + 3az, at P(x = 5, y = 2, z = -1). **(3)**
3. Demonstrate the ambiguity that results when the cross product is used to find the angle between two vectors by finding the angle between A=3ax−2ay+4az and B=2ax+ay−2az. Does this ambiguity exist when the dot product is used? **(2)**
4. Find **(a)** The vector component of F = 10ax - 6ay + 5az that is parallel to G = 1ax + 2ay + 3az; **(b)** The vector component of F that is perpendicular to G; **(c)** The vector component of G that is perpendicular to F. **(3)**
5. Express the unit vector *ax*​in spherical components at the point: **(a)** r = 2, *θ*=1 rad, *ϕ*= 0.8rad; **(b)** x = 3, y = 2, z = -1; **(c)***ρ* = 2.5, *ϕ* = 0.7 rad, z = 1.5. **(5)**
6. Express in cylindrical components: **(a)** the vector from C(3, 2, -7) to D(-1, -4, 2); **(b)** a unit vector at D directed toward C; **(c)** a unit vector at D directed toward the origin. **(4)**