# COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & computer Control Engineering

Lecturer : Prof. Dr. Medhat El Singaby

Course : Electric and Magnetic Fields (2)

Course Code : EE 333 Marks : 40

Date : 19/1/2016 Time : 2 hours

## Final Exam

**Answer the following questions:**

### Question no.1 A-3

a) For the loop shown in Fig.1,compute the magnetic flux density at point 'o' ,if I = 10 A, a = 1 cm and b = 2 cm.

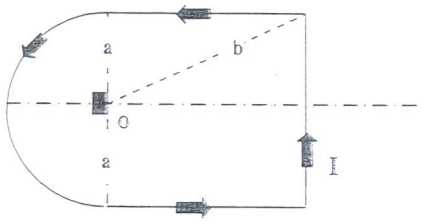


Fig.1

b) For a square loop with each side "l" meters and carrying a current " i " Amperes. This loop is placed between two poles of a permanent magnet such that the magnetic field density is " B ".IF the plane of the loop is inclined by $\Theta^0$ with the direction of 'B'.Determine

(i) The magnetic moment acting on the loop.
(ii) The mechanical torque acting on the loop.
(iii) Explain why the mechanical torque is changing while the loop is rotating.

(10 marks)

### Question no.2 B-1

a) Two parallel linear wires, each of length 10 m, spaced by a distance 0.01 m, the first wire carrying a current 10 A, the second one carrying a current 20 A in the same direction. Determine

(i) The location of a line having zero flux density 'B'.
(ii) The force acting between the two wires.
(iii) Repeat (i), if the currents in the two wires are in opposite directions And comment on the result.

b) Define the Ampere from the electromagnetic point of view. (10 marks)

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## Question no.3

A-2

a) For a thick coaxial cable carrying a current I in its inner conductor and a current –I in its outer conductor. Find the magnetic fields in the following regions:

(i) Inside the inner conductor.
(ii) Between the two conductors.
(iii) Inside the outer conductor.
(iv) Outside the cable.

Draw a simple sketch relating the field intensity in these regions.

b) Starting from the Biot-savart law in the three dimensions;
Prove that the magnetic field density at the center of a long solenoid is twice that at its ends?

(10 marks)

## Question no.4

C-1

a) Define the magnetization from a physical and mathematical point of view.

b) Compute the reluctance of the magnetic circuit shown in Fig.2.also calculate the flux density in the air gaps taking into consideration the firing effect.

(N = 100 turns , I = 1 A, the length of gap -1 equal to that of gap -2 and both are 2 mm; cross section area of the two air gaps are square and equal to 5 $cm^2$ each)

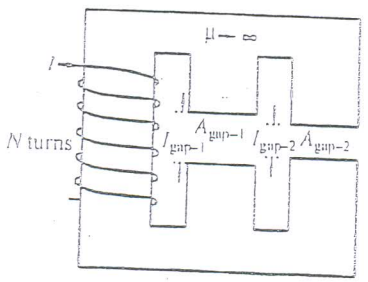


Fig.2

(10 marks)

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