ROLL NO. _____

Code: AE105 Subject: PRINCIPLES OF ELECTRICAL ENGINEERING

AMIETE – ET *{NEW SCHEME}*

Time: 3 Hours **JUNE 2015** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Which of the following relation is wrong?

(A) MMF = Flux × Reluctance **(B)** Reluctance = length / $\mu_o\mu_r$ (Area)
(C) $B = \mu H$ **(D)** MMF = μB

b. Hysteresis losses (ρ_h) are

(A) $\rho_h \alpha\, Bf$ **(B)** $\rho_h \alpha\, B^2 f^2$
(C) $\rho_h \alpha\, B^x f$ **(D)** $\rho_h \alpha\, B^x f^y$

c. Air cored transformers are used for

(A) Radio devices **(B)** Voltage measurement
(C) Current measurement **(D)** None of these

d. The Voltage Regulation of transformer is zero, the load connected in secondary winding is

(A) UPF load **(B)** leading power factor load
(C) lagging power factor of load **(D)** All of these

e. In DC machines, Lap wound armature is used for

(A) High voltage & Low current **(B)** High voltage & High current
(C) Low voltage & Low current **(D)** Low voltage & High current

f. When the constant losses in a dc motor is P_k, the efficiency will be maximum at an armature current (I_a) of

(A) $I_a = \sqrt{\frac{P_k}{R_a}}$ **(B)** $I_a = \frac{P_k}{R_a}$

(C) $I_a^2 R_a = (P_k)^2$ **(D)** $I_a = \frac{V}{R_a}$

g. A 4 pole 3 phase induction motor is connected with 400 V, 50 Hz AC supply and running at 6% slip. The frequency of rotor emf is

(A) 50 Hz **(B)** 3 Hz
(C) 6 Hz **(D)** zero

h. What is slip corresponding to backward field

(A) $s_b = s_f$ **(B)** $s_b = s$

(C) $s_b = 2 - s$ **(D)** $s_b = 1 - s$

i. Which of the following is disadvantage of HVDC?

(A) Ground return is possible
(B) There is no charging current
(C) Harmonics are generated which require filters
(D) Line losses are smaller

j. Induction type instruments have deflection torque

(A) $T_d \alpha \phi_1 \phi_2$ **(B)** $T_d \alpha I$

(C) $T_d \alpha I^3$ **(D)** $T_d \alpha \phi$

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Define the following:
(i) Permeability (ii) Magnetic field density **(2×2)**

b. Consider core shown in Fig.1 has a relative permeability of 4000. The central limb is required to carry a flux of 0.01 Wb. Find current needed in excitation coil. **(12)**

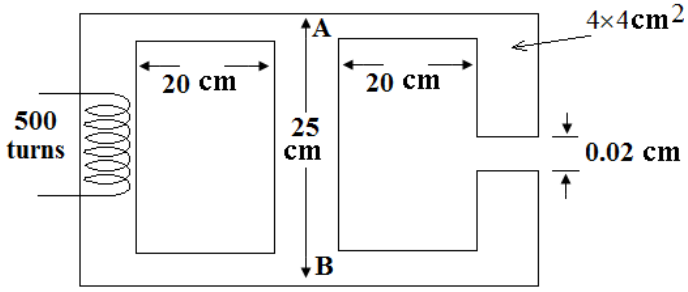

Fig.1

Q.3 a. Discuss how to obtain the simplified circuit model of transformer referred to primary side. **(10)**

b. A 50 KVA, 2200/110 V transformer is connected to 110 V supply with metering. Keeping 2200 V side open, the meter readings are
Voltmeter = 110 V
Ammeter = 10 A
Wattmeter = 400 W
(i) Compute shunt branch parameters of equivalent circuit as seen from LV side and HV side.
(ii) Compute iron losses. **(6)**

Q.4 a. Derive EMF equation of DC machine. **(8)**

b. Discuss the following:
(i) Function of compensating winding
(ii) Commutation **(4×2)**

Q.5 a. A 50 kW, 230 V dc shunt motor takes 14.5A when running at 1640 rpm. Its resistances are $R_a = 0.15\Omega$ and $R_{sh} = 120\Omega$
(i) Calculate motor efficiency when it takes 215A.
(ii) What is maximum efficiency of motor? **(8)**

b. Discuss operation of synchronous motor at constant load and variable excitation, also draw V-curves. **(8)**

Q.6 a. Draw & explain torque-slip characteristic of 3 phase induction motor and discuss effect of change in rotor resistance on it, keeping supply voltage constant. **(8)**

b. Explain speed control of 3 phase induction motor using:
(i) Voltage control method
(ii) Rotor resistance control method **(8)**

Q.7 Discuss working of the following motors:

(i) Resistance split phase motor
(ii) Capacitor split phase motor
(iii) Reluctance motor
(iv) Hysteresis motor **(4×4)**

Q.8 a. Explain the following:
(i) Transmission efficiency
(ii) Kelvin's law **(4×2)**

b. Discuss principle of AC/DC conversion using layout of main components used in HVDC transmission. **(8)**

Q.9 Discuss the following in brief:

(i) Controlling torque in indicating instruments
(ii) Moving iron instruments
(iii) Earthing & its need
(iv) Conduct wiring **(4×4)**