ROLL NO. _____

Code: AE55 Subject: PRINCIPLES OF ELECTRICAL ENGINEERING

AMIETE – ET (NEW SCHEME)

Time: 3 Hours **JUNE 2012** **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. As the load is increased, the speed of dc shunt motor_____

(A) increases proportionally **(B)** remains constant
(C) increases slightly **(D)** reduces slightly

b. The voltages induced in the three windings of a three phase alternator are____ degree apart from each other.

(A) 120 **(B)** 60
(C) 90 **(D)** 30

c. Lap wound dc machines are employed where

(A) high current and low voltage is required
(B) high current and high voltage is required
(C) low current and high voltage is required
(D) low current and low voltage is required

d. Control rods of nuclear reactor are made of

(A) Boron **(B)** Cast iron
(C) Beryllium **(D)** Steel

e. The full load copper loss of transformer is 1600 W. At half load the copper loss will be

(A) 6400 W **(B)** 1600 W
(C) 800 W **(D)** 400 W

f. The maximum speed of 50 Hz synchronous generator is

(A) 3000 rpm **(B)** 300 rpm
(C) 1000 rpm **(D)** 1500 rpm

g. The hysteresis loop of ferrites has

(A) large area under the B-H curve
(B) small area under the B-H curve
(C) moderate area under the B-H curve
(D) none of these

h. Fuel cell is used to convert _____ energy into electrical energy.

(A) mechanical **(B)** chemical
(C) solar **(D)** physical

i. The full load speed of 3-phase, 230 V, 4-pole, 50 Hz induction motor is 1445 rpm. Slip is

(A) 0.036 **(B)** 3.6
(C) 0.36 **(D)** 0.0036

j. Motors used in phonographic appliances is

(A) Reluctance motor **(B)** Hysteresis motor
(C) Shaded pole motor **(D)** Universal motor

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

Q.2 a. Write short note on:

(i) Eddy current loss (ii) Mutual Inductance **(4×2)**

b. An iron ring of 20 cm mean diameter having a cross section of 100 cm^2 is wound with 400 turns of wire. Calculate the exciting current required to establish a flux density of 1 Wb/m^2 if the relative permeability of iron is 1000. What is the value of energy stored? **(8)**

Q.3 a. Define efficiency and derive the condition for maximum efficiency for a transformer. **(8)**

b. A single phase transformer having a voltage of 400 V in the primary winding and 100 V in the secondary winding takes a no load current of 0.4 A at 0.3 power factor lagging. The secondary winding supplies a current of 100 A at 0.6 power factor. Determine the primary winding current. **(8)**

Q.4 a. Explain armature reaction in DC machines, write various methods used to reduce the armature reaction. **(8)**

b. A 6 pole dc shunt motor is energized by 230 V dc supply. The motor has 450 conductors that are wound in lap configuration. It takes 30 A current from the supply system and develops output power of 5560 W. The current through the field windings is 3 A and the flux per pole is 25 mWb. The armature resistance is 0.8 Ω. Find the speed and the shaft torque. **(8)**

Q.5 a. Draw suitable phasor diagram of synchronous motor operating at different power factors. **(8)**

b. A 3-phase, 16 pole star connected alternator has 144 slots and 6 conductors per slot. The flux per pole is 0.03 Wb sinusoidally distributed and the speed is 375 rpm. If the coil span is 160º, calculate

(i) frequency (ii) pitch factor
(iii) distribution factor (iv) phase and line emfs. **(8)**

Q.6 a. Discuss different types of starter used for 3 phase Induction motor. **(8)**

b. The efficiency of a 400 V, 3-phase, 6-pole induction motor draws a line current of 80 A at 4% slip, is 85%. Calculate the output power and shaft torque. **(8)**

Q.7 Write short notes on any **TWO**: **(8×2)**

(i) Shaded pole motor
(ii) Universal motor
(iii) Hysteresis motor

Q.8 With the help of a neat diagram explain the function of various components of a thermal power plant. **(16)**

Q.9 a. Discuss in detail various methods of energy storage. **(8)**

b. Explain power transmission system. **(8)**