ROLL NO. _____

Code: AE10 **Subject: ELECTRICAL ENGINE**

AMIETE – ET (OLD SCHEME)

Time: 3 Hours **DECEMBER 2011** **Max. Marks: 100**

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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. One of the following of 3-phase transformer used in distribution has

(A) Delta-Delta connection **(B)** Star-Star connection
(C) Star-Delta connection **(D)** Delta-Star connection

b. At constant supply voltage, with rise in frequency Iron losses of transformer

(A) Decreases **(B)** Increases
(C) Remains constant **(D)** None of the above

c. In cylindrical rotor synchronous machine

(A) $X_d > X_q$ **(B)** $X_d < X_q$
(C) $X_d = X_q$ **(D)** None of the above

d. Which of the following motor is used in domestic appliances?

(A) DC series motor **(B)** DC shunt motor
(C) DC compound motor **(D)** Universal motor

e. Single Phase Induction motor has

(A) Rotating magnetic field **(B)** No magnetic field
(C) Zero starting torque **(D)** Pulsating torque

f. Which of the following curve (Fig.1) represent torque Vs. armature current characteristic of a DC series motor?

(A) Curve a
(B) Curve b
(C) Curve c
(D) Curve d

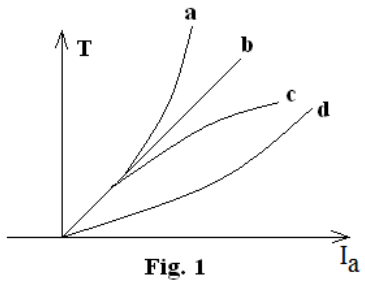

Fig. 1

g. Slip(s) at which 3-phase induction motor develops maximum torque is

(A) s=0 **(B)** s=1

(C) $s = \frac{R_2}{X_2}$ **(D)** None of the above

h. Which of the following power plant has maximum efficiency?

(A) Thermal power plant **(B)** Combined cycle plant
(C) Hydro power plant **(D)** Diesel generator

i. Carrier current protection is used to protect_____

(A) transformers **(B)** alternators
(C) transmission lines **(D)** feeders

j. Which of the following material is used in heating elements?

(A) Nichrome **(B)** Tungsten
(C) Iron **(D)** Copper

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

Q.2 a. Compare core type and shell type construction of transformer. **(8)**

b. A 10 kVA, transformer has 0.4 kW iron losses and 0.6 kW full load copper losses. Determine
(i) Efficiency of transformer at full load 0.8 pf leading.
(ii) Load at which maximum efficiency occurs.
(iii) Maximum efficiency if power factor is unity. **(8)**

Q.3 a. Explain working principle of 3-phase synchronous motor. **(6)**

b. 3-phase star connected alternator has Rotor—No of poles = 4, Flux per pole = 0.05 Wb, Speed of rotation = 1500 rpm. Stator—No of slots = 72, Conductors per slot = 10, coil span = 150°. Determine
(i) Pitch factor and distribution factor
(ii) emf induced per phase
(iii) Line voltage. **(10)**

Q.4 a. Draw cross sectional diagram of DC machine and discuss function of its various components. **(8)**

b. Explain the various methods used to obtain speed control of DC shunt motor, above and below rated speed. **(8)**

Q.5 a. Discuss working principle of 3-phase induction motor. Also explain slip of an induction motor. **(8)**

b. Determine the ratio of starting torque to full load torque of a 3-phase induction motor for (i) Star-Delta starter (ii) Auto transformer starter with 50% tapping. The short circuit current of the motor is 5 times the full load current and full load slip is 5%. **(8)**

Q.6 a. Explain working of variable reluctance stepper motor using suitable diagrams. **(8)**

b. Explain working of AC servomotor and draw family of torque-speed curves for this motor. **(8)**

Q.7 Draw complete layout of thermal power plant and explain salient features of a modern coal-fired steam power plant. **(16)**

Q.8 a. What is HVDC transmission? Compare it with HVAC transmission. **(8)**

b. Explain operating principle of electromagnetic relays. **(8)**

Q.9 a. Draw block diagram of an electrical drive and write function of its each component. **(8)**

b. Discuss various advantages of electrical drives. **(8)**