

Code: AE10

Subject: ELECTRICAL ENGINEERING

**AMIETE – ET (OLD SCHEME)**

Time: 3 Hours

**OCTOBER 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. A single phase transformer has zero voltage regulation when connected load is

- (A) Pure resistive (B) Lagging pf load  
(C) Leading pf load (D) Pure capacitive load

b. A single phase transformer has maximum efficiency when

- (A) Iron losses are zero (B) Copper losses are zero  
(C) (A) and (B) both are correct (D) Iron losses = Copper losses

c. A Hysteresis motor

- (A) is not a self starting motor (B) is a constant speed motor  
(C) needs dc excitation (D) cannot be run in reverse speed

d. In DC generators commutator acts as:

- (A) Rectifier (B) Reverse switch  
(C) Voltage converter (D) None of the above

e. For Star-Delta starter used for 3-phase induction motor relation between starting torque and full load torque is

- (A)  $\frac{T_{st}}{T_{fl}} = \left(\frac{I_{sc}}{I_{fl}}\right)^2 s_{fl}$  (B)  $\frac{T_{st}}{T_{fl}} = \frac{1}{3} \left(\frac{I_{sc}}{I_{fl}}\right)^2 s_{fl}$   
(C)  $\frac{T_{st}}{T_{fl}} = k^2 \left(\frac{I_{sc}}{I_{fl}}\right)^2 s_{fl}$  (D) None of the above

f. Rotating magnetic field is produced by

- (A) Single phase AC only (B) Two phase AC only  
(C) Three phase AC only (D) Both two phase and three phase AC

AE10 / OCTOBER - 2012

1

AMIETE - ET (OLD SCHEME)

**Code: AE10****Subject: ELECTRICAL ENGINEERING**

- g. Universal motor operates
- (A) Only with AC supply                      (B) Only with DC supply  
(C) Both AC and DC supply                (D) None of the above
- h. Which of the following is source of non-conventional energy is
- (A) Thermal energy                              (B) Nuclear energy  
(C) Hydro energy                                (D) Wind energy
- i. Increase in voltage for transmission
- (A) Decreases conductor size                (B) Decreases energy loss  
(C) Improves voltage regulation            (D) All of the above
- j. Electrolyte used in lead-acid battery is
- (A)  $H_2SO_4$                                       (B) HCl  
(C)  $HNO_3$                                       (D) KOH

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

- Q.2** a. Draw and Explain approximate equivalent circuit of transformer. Write various assumptions made. (8)
- b. A single phase transformer on no load has a core loss of 50 W, draws a current of 2 A, and has an induced emf of 230 V. Determine
- (i) No load power factor  
(ii) Core loss current and magnetizing current  
(iii) No load equivalent circuit parameters.  
Draw no load equivalent circuit also. (8)
- Q.3** a. Draw various characteristics of DC series and DC shunt motors. Also write their applications. (8)
- b. A DC shunt generator delivers 50 kW at 250 V, when running at 400 RPM. The armature and shunt field resistances are  $0.02 \Omega$  and  $50 \Omega$  respectively. Calculate the speed of the machine when running as a shunt motor and taking 50 kW at 250 V. Assume 1 V per brush for brush contact drop. (8)
- Q.4** Discuss the following regarding lead-acid battery:
- (i) Constructional details                      (ii) Active materials used in cell  
(iii) Chemical reactions                        (iv) Charging and applications. (16)
- Q.5** Explain working principle and discuss the advantages along with the applications of the following:
- (i) Hysteresis motor                              (ii) Reluctance motor. (16)

**Code: AE10****Subject: ELECTRICAL ENGINEERING**

- Q.6** a. Compare induction motors and synchronous motors based on their features and applications. (8)
- b. Draw and explain torque-slip characteristics of 3-phase induction motor using torque equation. (8)
- Q.7** a. What is solar energy? Write various applications of solar-thermal energy. (8)
- b. Draw layout of pumped storage hydro power plant and write function of Base-Load and Peak-Load plants. (8)
- Q.8** a. Give comparison between squirrel cage and slip ring induction machine. Discuss the working principle of three phase induction motor. (8)
- b. Draw circuit diagram of DOL starter used for 3-phase induction motor and explain its working. (8)
- Q.9** a. Explain choice of working voltage for transmission and write advantages of high voltage transmission. (8)
- b. Compare between AC and DC systems for transmission and distribution. (8)