

AMIETE – ET (OLD SCHEME)

Code: AE10
Time: 3 Hours

Subject: ELECTRICAL ENGINEERING
Max. Marks: 100

JUNE 2011

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. In motor, unidirectional torque is produced with the help of
- (A) Brushes (B) Commutator
(C) End plates (D) both (A) & (B)
- b. Malfunctioning of the Buchholz relay may be caused by
- (A) excessive overheating of the transformer
(B) heavy external short circuits
(C) dropping of the oil level below the relay level during operation
(D) improper earthing
- c. Transformer core are laminated in order to
- (A) simplify the construction (B) minimize eddy current loss
(C) reduce cost (D) reduce hysteresis loss
- d. Single phase induction machine has very wide applications because
- (A) they are light in weight (B) they require less maintenance
(C) inexpensive (D) rotates only in one direction
- e. A stepper motor is a _____ device
- (A) mechanical (B) electrical
(C) analogue (D) incremental
- f. A three phase , 4 pole, 50Hz, induction motor runs at a speed of 1440rpm. The rotating field produced by the rotor rotates at a speed of _____ rpm with respect to the motor
- (A) 1500 (B) 1440
(C) 60 (D) 400

- g. As the load is increased, the speed of dc shunt motor
- (A) increases proportionally (B) remains constant
(C) increases slightly (D) reduces slightly
- h. Welding leads have
- (A) high flexibility (B) high current handling capacity
(C) both (A) & (B) (D) only (A)
- i. Carrier protection scheme is normally used for protection of
- (A) Transformers (B) Feeders
(C) Long transmission lines (D) Generators
- j. The welding arc circuit is
- (A) never earthed (B) always earthed
(C) earthed through cables only (D) none of above

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

- Q.2** a. Derive the condition for zero voltage regulation. Also show that the magnitude of maximum voltage regulation equals the per unit value of equivalent leakage impedance. (8)
- b. The parameter of the equivalent circuit of a 150-KVA, 2400/240-V transformer are:
 $R_1 = 0.2\Omega$ $R_2 = 2 \times 10^{-3}\Omega$
 $X_1 = 0.45\Omega$ $X_2 = 4.5 \times 10^{-3}\Omega$
 $R_0 = 10\text{ k}\Omega$ $X_m = 1.6\text{ k}\Omega$ (as seen from 2400 Volt side)
 Calculate
 (i) open circuit current, power and power factor when LV is excited at rated voltage
 (ii) the voltage at which the HV should be excited to conduct a short-circuit test (LV shorted) with full-load current flowing. What is the input power and its power factor? (2+4+2)
- Q.3** a. Explain the equivalent circuit model of synchronous machine with neat circuit diagram. (8)
- b. Write short notes on –
 (i) Operating principle of synchronous motor
 (ii) Application of Synchronous motor (4+4)
- Q.4** a. What is the use of starter in DC motor? Explain with suitable example. (8)
- b. A 400V dc shunt motor takes a current of 5.6 A on no-load and 68.3A on full-load. Armature reaction weakens the field by 3%. Calculate the ratio of full-load speed to no-load speed. Given $R_a = 0.18\Omega$, brush voltage drop = 2V, $R_F = 200\Omega$. (8)

- Q.5** a. Explain different types of starters used for three phase induction motor.
- b. A 6-pole, 50 Hz, 3-phase induction motor running on full load develops a useful torque of 160 Nm when the rotor emf makes 120 complete cycles per minute. Calculate the shaft power output. If the mechanical torque lost in friction and that for core-loss is 10Nm. The total stator loss is given to be 800W. Compute,
- (i) the copper-loss in the rotor winding
 - (ii) the input to the motor and
 - (iii) the efficiency (8)
- Q.6** a. Explain the construction and working of AC tachometer and give its application. (8)
- b. Explain with suitable diagram the construction of stepper motor and also mention its applications. (8)
- Q.7** a. Draw a neat sketch of a nuclear power plant and explain the function of each component in it. (8)
- b. What is solar energy? How can solar energy be converted in electric energy? (8)
- Q.8** a. Give comparison between overhead lines and underground cables. (8)
- b. What is a protective relay? Explain the function and characteristics of a protective relay? (8)
- Q.9** a. Give comparison between A.C. and D.C. welding. (8)
- b. Write the name of motor which is most suitable for (8)
- (i) Drilling machine
 - (ii) Domestic appliances
 - (iii) Rolling mill
 - (iv) Textile industry
 - (v) Blowers & fans
 - (vi) Paper industry
 - (vii) Machine tools
 - (viii) Air compressors