

AMIETE – ET (OLD SCHEME)Code: AE1
Time: 3 Ho**JUNE 2009**Subject: ELECTRICAL ENGINEERING
Max. Marks: 100**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.
- 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. Transformer-core laminations are made of
- (A) Cast iron. (B) Wrought iron.
(C) Silicon Steel. (D) Cast steel.
- b. For successful parallel operation of two single-phase transformers, the essential condition is that their
- (A) Percentage impedances should be equal.
(B) Turn ratios should be exactly equal.
(C) Polarities must be properly connected.
(D) KVA ratings should be equal.
- c. If the field of a synchronous motor is under excited, the power factor will be
- (A) Lagging. (B) Leading.
(C) Unity. (D) More than unity.
- d. In DC machine, the armature reaction mmf is
- (A) Stationary with respect to armature.
(B) Rotating with respect to stator.
(C) Stationary with respect to stator.
(D) Rotating with respect to brushes.
- e. If a 3-phase, 4 pole, 50 Hz induction motor runs at a speed of 1440 r.p.m, then the slip is
- (A) 0.03. (B) 0.10.
(C) 0.04. (D) 0.05.
- f. The voltage applied to the rotor of synchro is always
- (A) DC negative. (B) DC positive.
(C) AC. (D) may be AC or DC.

- g. Nuclear power station is normally used for
- (A) peak load. (B) base load.
(C) average load. (D) any load.
- h. A distance relay measures
- (A) Difference in voltage. (B) Difference in impedance.
(C) Difference in current. (D) Difference in phase.
- i. The efficiency of an induction motor under blocked rotor test conditions is
- (A) 0.00%. (B) 100%.
(C) 60%. (D) 94%.
- j. Welding is not done directly from the supply mains as
- (A) Its voltage is too high.
(B) It is impracticable to draw heavy currents directly from the supply mains.
(C) Its voltage remain fluctuating.
(D) None of the above.

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

- Q.2** a. What are the different losses in a transformer? State and prove the condition for maximum efficiency of a transformer. (8)
- b. A 100 kVA, 1100/230 V, 50 Hz transformer has an HV winding resistance of 0.1Ω and a leakage reactance of 0.4Ω . The LV winding resistance of 0.006Ω and a leakage reactance of 0.01Ω . Find the equivalent winding resistance, reactance and impedance referred to the HV and LV sides. (8)
- Q.3** a. Explain in brief the followings:
- (i) In what condition is a synchronous machine referred to as a synchronous condenser?
(ii) Why is a synchronous machine non self starting? How can it be made self starting? (4+4)
- b. A 440 V, 50 Hz, Δ -connected synchronous generator has a direct axis reactance of $0.12 \Omega/\text{phase}$ and a quadrature axis reactance of $0.075 \Omega/\text{phase}$; the armature resistance being negligible. The generator is supplying 1000A at 0.8 lagging pf.
- (i) Find the excitation emf neglecting saliency and assuming $X_S = X_D$.
(ii) Find the excitation emf accounting for saliency. (8)
- Q.4** a. Derive the exact equivalent circuit of a 3-phase induction motor. What is the difference between the exact and approximate equivalent circuits? From the approximate equivalent circuit, find the (i) rotor output, (ii) output power and (iii) output torque. (8)
- b. Explain double field revolving theory as applied to single phase induction motor. Mention few applications of single phase induction motor. (8)
- Q.5** a. Explain the construction, working and applications of a stepper motor. (8)

- b. Explain the working of AC tachometer. Also mention its applications. **(8)**
- Q.6** a. Draw the typical layout of Hydro station and explain the function of each component. **(8)**
- b. Write notes on (i) Gas turbine and (ii) Diesel generators. **(8)**
- Q.7** a. What is meant by a circuit breaking? Discuss different methods of interrupting the arc current in circuit breakers. **(8)**
- b. What is relay? Give a classification of relay. What are the main features of a good protective relay? **(8)**
- Q.8** a. What is solar energy? How solar energy may be utilized for generation of electrical power? Discuss with the help of a neat sketch. **(8)**
- b. What is the principle of HVDC transmission? Give the application of HVDC. Discuss the advantages and operational problems of HVDC transmission. **(8)**
- Q.9** Write short technical notes on following:
- (i) Accumulators
 - (ii) Switched reluctance motor
 - (iii) Industrial drives
 - (iv) Button cells
- (4 × 4 = 16)**