

Code: AE1
Time: 3 Ho

DECEMBER 2008

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.
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Q.1 Choose the correct or best alternative in the following: (2x10)

- a. The desirable properties of transformer core materials are:
 (A) low permeability and low Hysteresis loss
 (B) high permeability and high Hysteresis loss
 (C) high permeability and low Hysteresis loss
 (D) low permeability and high Hysteresis loss
- b. AC tachometers are often built with thin metallic drag-cup rotor to
 (A) to reduce inertia
 (B) to make suitable for high frequency operation
 (C) to increase efficiency
 (D) none of above
- c. The speed of universal motor can be controlled by:
 (A) introducing a variable resistance in series with the motor
 (B) tapping the field at various points
 (C) centrifugal mechanism
 (D) all of the above
- d. An ideal synchronous motor has no starting torque because the:
 (A) rotor is made up of salient poles
 (B) relative velocity between rotor and stator mmf's is zero
 (C) rotor winding is highly reactive
 (D) none of the above
- e. In a nuclear power station using Boiling Water Reactor, water is used as:
 (A) moderator but not as a coolant (B) a coolant but not as a moderator
 (C) both moderator and coolant (D) neither moderator nor coolant
- f. In a short transmission line, voltage regulation is zero when the power factor angle of the load at the receiving end side is equal to:
 (A) $\tan^{-1}\left(\frac{X}{R}\right)$ (B) $\tan^{-1}\left(\frac{R}{X}\right)$

(C) $\tan^{-1}\left(\frac{X}{Z}\right)$

(D) $\tan^{-1}\left(\frac{R}{Z}\right)$

- g. Capacitor in a single phase induction motor is used for
 (A) improving the power factor (B) improving the starting torque
 (C) starting the motor (D) reducing the harmonics
- h. The temperature of resistance furnaces can be controlled by changing the:
 (A) applied voltage (B) number of heating elements
 (C) circuit configuration (D) all of the above
- i. While running at no load, the losses taking place in an induction motor:
 (A) rotor copper losses (B) friction and windage losses
 (C) stator copper losses (D) all of the above
- j. The arc is interrupted in a circuit breaker at
 (A) zero current (B) maximum current
 (C) zero voltage (D) maximum voltage

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

- Q.2** a. Describe the constructional features and working principle of a single phase transformer. (8)
- b. Derive the condition of maximum efficiency of a transformer. A transformer is rated 200V/50V, 10kVA has a core loss of 100 watts. What is maximum efficiency of the transformer at 0.8 lagging power factor? Assume full load copper loss as 200 watts. (8)
- Q.3** a. Explain main characteristics of 3-phase synchronous motor. (6)
- b. A 3-phase, 50 Hz, 20 pole, salient pole alternator with star connected stator winding has 180 slots on the stator. Each slot consists of 8 conductors. The flux per pole is 25 mWb and is sinusoidally distributed. The coils are full pitched. Calculate (i) speed of alternator, (ii) winding factor and (iii) generated emf per phase. (10)
- Q.4** a. Explain armature reaction in DC machine. (8)
- b. A 250V DC shunt motor having an armature resistance of 0.25 ohm, carries an armature current of 50A, and runs at 750 rpm. If the flux is reduced by 10%, find the speed. Assume that the torque remains same. (8)
- Q.5** a. Explain working principle of Induction Generator. (6)

- b. The power input to a 500V, 50Hz, 6-pole, 3-phase, squirrel cage induction motor running at 975 rpm is 40 kW. The stator losses are 1kW and the friction and windage losses are 2kW. Calculate:
(i) slip, (ii) rotor copper loss and (iii) efficiency. **(10)**

- Q.6** Write short notes on any TWO **(8x2)**
(i) Machine in control systems

(ii) Stepper motor
(iii) AC tachometers

- Q.7** a. Discuss the criteria for site selection of various types of generating plants. **(8)**
b. Compare gas turbine and diesel generator. **(8)**

- Q.8** a. What is inductive interference? Discuss its causes and remedial measures. **(8)**
b. Discuss characteristics of overhead lines and cables. **(8)**

- Q.9** a. Discuss button cells and their use for low power applications. **(8)**
b. Explain general principle of solid state controller for industrial drive. **(8)**