

AMIETE – ET (Current Scheme)

Time: 3 Hours

June 2018

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. The maximum efficiency of a 100 kVA transformer having iron loss of 900 kW and full load Cu loss of 1600 kW occurs at _____ kVA.
(A) 56.25 (B) 133.3
(C) 75 (D) 177.7
- b. A 4-pole, 1200 rpm alternator will generate emf at a frequency of
(A) 60Hz (B) 50Hz
(C) 40Hz (D) 25Hz
- c. The core of a transformer is made of
(A) Annealed copper (B) Silicon steel
(C) Seasoned wood (D) Aluminium
- d. The slip of an induction motor under full load condition is about
(A) 0.03 (B) 0.1
(C) 0.2 (D) zero
- e. Keeping flux density constant, the iron loss of certain transformer at half of the rated voltage is measured as 400 W. Then the iron loss at rated voltage will be
(A) 800 W (B) 200 W
(C) 400 W (D) 1600 W
- f. Which of the following power plant has least running cost per KWH or KWh?
(A) Diesel power plant (B) Nuclear power plant
(C) Thermal power plant (D) Hydro-electric power plant
- g. No load test on a transformer is carried out to determine
(A) Copper loss (B) Magnetising Current
(C) Core loss (D) Efficiency of the transformer

- h. The rating of battery is expressed in
(A) Volt-ampere (B) Kilovolt-ampere
(C) Ampere-hour (D) Watt-hour
- i. Cooling of transformer is required so as to
(A) increase the efficiency
(B) reduce the losses
(C) reduce lummung
(D) dissipate the heat generated in the windings
- j. Under full load running conditions, the slip of a synchronous motor is
(A) zero (B) about 0.01
(C) about 0.1 (D) unity

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

- Q.2** a. A ring has a diameter of 21 cm and a cross-sectional area of 10 cm^2 . The ring is made up of two semicircular sections of cast iron and cast steel, with each joint having reluctance equal to an air-gap of 0.2 mm. Find the ampere-turns required to produce a flux of $8 \times 10^{-4} \text{ wb}$. The relative permeability of cast steel and cast iron are 800 and 166 respectively. Neglect fringing and leakage effect. (8)
- b. A conducting circular loop is placed in an uniform magnetic field $B=0.020 \text{ T}$ with its plane perpendicular to the field. Somehow, the radius of the loop starts shrinking at a constant rate of 1.0 mm/s. Find the induced emf in the loop at an instant when the radius is 2 cm. (8)
- Q.3** a. Explain the efficiency and losses in the transformer. (8)
- b. Explain, how you can determine the parameters of circuit model of a transformer, experimentally? (8)
- Q.4** a. Explain two methods of speed control of DC Shunt motors. (8)
- b. Draw and explain the power flow diagram for a DC generator. (8)
- Q.5** a. Explain torque/ slip characteristics of three phase induction motor under starting and full load conditions. What is the effect of rotor resistance on the shape of characteristics? (8)
- b. A 3300V star-connected synchronous motor has synchronous impedance of $0.4+j5 \Omega$ per phase. For an excitation e.m.f. of 4000V and motor input power of 1000KW at rated voltage. Compute the line current and Power factor. (8)

Code: AE55**Subject: PRINCIPLES OF ELECTRICAL ENGINEERING**

- Q.6** a. Prove that the frequency of the rotor induced emf in an induction motor is slip times the stator supply frequency. (8)
- b. Explain why a three-phase induction motor rotates always with a speed less than the synchronous speed. (8)
- Q.7** a. Explain the construction and principle of operation of split phase AC motor. (8)
- b. Explain the construction and principle of operation of a single-phase universal motor. (8)
- Q.8** a. With the help of a neat diagram explain the function of various components of a Nuclear power plant. (8)
- b. Explain a Method to convert Solar Energy into Electrical Energy. (8)
- Q.9** a. Explain the constructional features and working of fuel cells. (8)
- b. Explain the importance of renewable energy resources for power generation. Discuss a method to extract electrical energy through wind power. (4+4)