

AMIETE – ET (Current Scheme)

Time: 3 Hours

DECEMBER 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 magnetic force on an iron ring is 1750 AT/m when the flux density is 1.1 T. the relative permeability of iron is
(A) 5 (B) 50
(C) 500 (D) 5000
- b. A single phase transformer has rating of 15kVA, 600/120 Volt. It is connected as an auto transformer to supply at 720 volt from a 600 volt primary side. The maximum load it can supply is
(A) 90kVA (B) 18kVA
(C) 15kVA (D) 12kVA
- c. The voltage regulation of a transformer at full load 0.85pf lagging is 5%. Its voltage regulation at full load 0.85pf leading will be
(A) Positive (B) Negative
(C) Same (D) Reduce and may even become negative
- d. A shunt generator running at 600 rpm has an induced emf of 200 V. if the speed increases to 750 rpm, the induced emf will be
(A) 150 V (B) 205 V
(C) 225 V (D) 250 V
- e. A synchronous motor operating at rated voltage draws 1.0pu current at 1.0 pf. The machine parameters are : synchronous reactance 1.0pu, armature resistance negligible. Apart from supplying its rated power, if the motor has to supply an additional leading power reactive power of 0.8pf, then the field current has to be increased by
(A) 42% (B) 46%
(C) 52% (D) 60%
- f. A 6 pole, 50Hz, 3 phase induction motor is running at 950 rpm and has rotor cu loss of 5kW. The rotor input is
(A) 5kW (B) 10kW
(C) 50kW (D) 100kW

- g. A capacitor start, capacitor run single phase induction motor is basically a
 (A) Ac series motor (B) DC series motor
 (C) 2 phase induction motor (D) 3 phase induction motor
- h. Pulverized coal is
 (A) Coal free from ash (B) Non-smoking coal
 (C) Coal which burns for long time (D) Coal broken into fine particle
- i. A solar cell is basically
 (A) a voltage source, controlled by flux of radiation
 (B) a current source, controlled by flux of radiation
 (C) an uncontrolled current source
 (D) an uncontrolled voltage source
- j. The efficiency of a single phase transformer under non-load conditions is
 (A) Zero (B) 50%
 (C) 98% (D) 100%

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

- Q.2** a. What is permeability and relative permeability? What are the magnetic quantities they relate? (3)
- b. A coil wound on an iron core is excited from an ac source at voltage V_{rms} . Write the expression for ϕ_{max} in the core. Why is it independent of the core reluctance? (5)
- c. A rectangular ring ferromagnetic material has a 16cm inner diameter a 20cm outer diameter and 2.5cm thickness. A coil of 750 turns is wound on the ring. It is found to produce a flux of 1.25mWb, the coil must carry 1A. Find the following quantities:
 (i) mmf (ii) magnetic field intensity
 (iii) flux density (iv) reluctance
 (v) permeability (vi) relative permeability (8)
- Q.3** a. What is a transformer? Explain the function it fulfils as an element of a power system. (3)
- b. State and prove the condition for maximum efficiency of a transformer. (5)
- c. A 15kVA, 2200/220V, 50Hz transformer gave the following test results:
 OC (LV side): 220V, 2.72A, 185W
 SC (HV side): 112V, 6.3A, 197W
 Compute the following:
 (i) Core loss
 (ii) Full load copper loss
 (iii) Efficiency at full load, 0.85 lagging power factor
 (iv) Voltage regulation at full load, 0.8 power factor lagging / leading. (8)

- Q.4** a. Why the armature reaction in dc machine is called cross-magnetizing? Can this affect the flux/pole? (3)
- b. Discuss the method of speed control of a dc series motor. (5)
- c. A 4-pole, 230V dc shunt motor has 888 wave connected conductors. It draws a field current of 0.6A to give a no-load flux of 5.4mWb. The armature resistance is 0.8 ohm. Calculate the motor speed at a no-load current of 2A. What would be the motor current (line) and speed when it develops a torque of 29.6 Nm? What is the speed regulation from no load to this torque? (8)
- Q.5** a. Why the SCC of synchronous machine is linear? (3)
- b. Under what condition does the voltage regulation of a synchronous generator become negative? Draw the phasor diagram in support of your answer. (5)
- c. A synchronous motor is drawing 50A from a 400V, 3-phase supply at unity power factor with a field current of 0.9A. The synchronous reactance is 1.3 ohm.
 (i) Find the power angle
 (ii) Assuming no change in mechanical load, find the value of field current which would result in a power factor of 0.8 leading. The magnetizing characteristic may be taken as linear. (8)
- Q.6** a. What is meant by standstill reactance of induction motor? How does it vary with speed? (3)
- b. What methods are used in starting squirrel-cage induction motor? Which method is used in what size of motor? Which is the most common method and what is its superiority? (5)
- c. A 6.6kV, 20-pole, 50Hz, 3-phase star connected induction motor has a rotor resistance of 0.12 ohm and a standstill reactance of 1.12 ohm. The motor has a speed of 292.5rpm at full load. Calculate
 (i) Slip at maximum torque and
 (ii) The ratio of maximum to full load torque. Neglect stator impedance. (8)
- Q.7** a. Why is single phase motor not self starting? (8)
- b. What is the working principle of reluctance motor? (8)
- Q.8** a. What are the renewable sources of energy? (6)
- b. Write short note on
 (i) Thermal power plant (ii) Solar power (2×5)
- Q.9** a. List the merits and demerits of having high transmission line voltage. (3)
- b. Write short note on energy stored in compressed air form. (5)
- c. What is the percentage saving in feeder copper if the line voltage in a 2-wire DC system is raised from 100V to 200V for the same power transmitted over the same power distance and having the same power loss? (8)