

AMIETE – ET (Current Scheme)

Time: 3 Hours

JUNE 2016

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 unit of flux density is _____.
 (A) Tesla (B) ATM/m^2
 (C) Wb/m^2 (D) All three are equivalent
- b. The efficiency of a transformer is maximum when _____.
 (A) it runs at half of the full load (B) it runs at full load
 (C) its Cu loss equals iron loss (D) it runs overload
- c. The speed of an induction motor _____.
 (A) Decreases too much with the increase of load.
 (B) Increases with the increase of load.
 (C) Decreases slightly with the increase of load.
 (D) Remains constant with the increase of load.
- d. For a step-up transformer value of K i.e., voltage transformation ratio is always
 (A) Greater than one (B) Less than one
 (C) Equal to one (D) None of these
- e. In a separately excited dc motor, the motor back emf _____.
 (A) Reduces the effective motor time constant
 (B) Increases the effective motor time constant
 (C) Does not affect the motor time constant
 (D) Reduces the effective motor time constant to zero
- f. Cells are connected in parallel in order to _____.
 (A) Increase the voltage available (B) Decrease the current available
 (C) Increase the current available (D) Decrease the voltage available
- g. The Q - factor of a coil is given by _____.
 (A) Its power factor $\cos \phi$
 (B) Ratio of max. Energy stored & energy dissipated per cycle
 (C) Reciprocal of its power factor
 (D) Ratio R/Z
- h. The relation between frequency, speed and number of poles is given by _____.
 (A) $N_s = 120 \times f / p$ (B) $f = 120 \times N_s / p$
 (C) $N_s = 120 \times p / f$ (D) $N_s = f \times p / 120$

- i. A single phase stator winding when excited with ac voltage produces _____.
- (A) A single rotating field rotating at synchronous speed
 (B) Two rotating fields rotating at synchronous speed in opposite direction
 (C) Two rotating fields rotating in the same direction but at different speeds
 (D) Two rotating fields rotating in the opposite direction and with different speeds
- j. In ac circuit the product of voltage and current is known as _____.
- (A) Power (B) Real power
 (C) Resistive power (D) Apparent power

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

- Q.2** a. Write the expression for B at a distance r from a long conductor carrying current i. What are the paths along which B is constant and its direction? (8)
- b. Explain, what is magneto-motive force and compare it with electromotive force. (4)
- c. What are hysteresis & eddy current losses? (4)
- Q.3** a. Explain briefly the ideal transformer as a circuit element. Can voltage & current ratios be adjusted independently? (4)
- b. Derive the EMF equation of a transformer. (4)
- c. A 50 kVA , 5000/500V, 50Hz, 1-phase transformer has the high voltage winding with a resistance of 8 ohms and low voltage winding with a resistance of 0.06 ohms. The no load losses of the transformer amount to 1000W. Calculate the efficiency of the transformer, when delivering its full rated output at a power factor of 0.8. (8)
- Q.4** a. Explain how speed control is achieved for DC shunt motors. (8)
- b. A 6-pole dc machine armature has 36 slots 2 coil sides/slot, 8 turns/coil and is wave wound. The pole shoe is 18 cm long and the mean air-gap diameter is 25 cm. The average flux density over one pole pitch is 0.8T. Find the gross torque and mechanical power output when the machine is operating as a motor at 1200 rpm with an armature input current of 10A. (8)
- Q.5** a. Explain two important functions served by the damper winding in a synchronous motor. State the various applications of synchronous motor. (8)
- b. Explain the constructional features of synchronous generator. What are the two types of generators? Derive EMF equation of a synchronous machine. (8)
- Q.6** a. Draw the torque-speed characteristics of a single phase induction motor and explain how it can be obtained? (8)
- b. Explain the different methods of starting an induction motor. (8)
- Q.7** a. Write short notes on the following:
 (i) Capacitor-start motor.
 (ii) Switched reluctance motor. (4+4)
- b. Describe the construction of hysteresis motor and show that it builds a running torque both at synchronous and asynchronous speed of the rotor. (8)
- Q.8** a. Write short notes on the following energy sources (3+3+2)
 (i) Wind (ii) Wave (iii) Bio fuels
- b. With the help of a neat sketch explain the various parts of a nuclear reactor. (8)
- Q.9** a. Enlist all the options available for Energy storage. Discuss in detail. (8)
- b. Explain application and advantages of storage batteries. (8)