

AMIETE – ET {NEW SCHEME}

Time: 3 Hours

JUNE 2014

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 magnitude of statically induced emf depends
- (A) the coil resistance (B) the magnitude of magnetic flux
(C) the rate of change of flux (D) all of these
- b. The 'sheath' is used in cable to
- (A) provide strength to the cable
(B) provide proper insulation
(C) prevent the moisture to entering the cable
(D) avoid chances of rust on strands
- c. The function of a starter in a dc motor is _____
- (A) to control its speed
(B) to avoid sparking
(C) to reduce the starting current up to safe values
(D) to minimize the armature reaction effect
- d. A 1:5 step-up transformer has 120V across the primary and 600 ohms resistance across the secondary. Assuming 100% efficiency, the primary current equals
- (A) 0.2 Amp (B) 5 Amps
(C) 10 Amps (D) 20 Amps
- e. While comparing magnetic and electric circuits, the reluctance of magnetic circuit is compared with which parameter of electric circuit?
- (A) current (B) resistance
(C) E.M.F (D) current density

- f. In electrical power system the generation voltage is usually
 (A) between 11 KV and 33 KV (B) between 132 KV and 400 KV
 (C) between 400 KV and 700 KV (D) None of these
- g. The drive motor used in a mixer-grinder is a
 (A) dc motor (B) induction motor
 (C) synchronous motor (D) universal motor
- h. Slip of the induction machine is 0.02 and the stator supply frequency is 50 Hz.
 What will be the frequency of the rotor induced emf?
 (A) 10 Hz (B) 50 Hz
 (C) 1 Hz (D) 2500 Hz
- i. Earthing should be designed such that:
 (A) grounding resistance should be as low as possible
 (B) grounding resistance should be as high as possible
 (C) grounding resistance should be always zero
 (D) none of these
- j. In order to reduce the harmful effects of harmonics on the A.C. side of a high voltage D.C. transmission system _____ are provided.
 (A) synchronous condensers (B) shunt capacitors
 (C) shunt filters (D) static compensators

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

Q.2 a. Explain in detail eddy current losses in a magnetic material. Explain the factors on which it depends. How it can be reduced? (3+3+2)

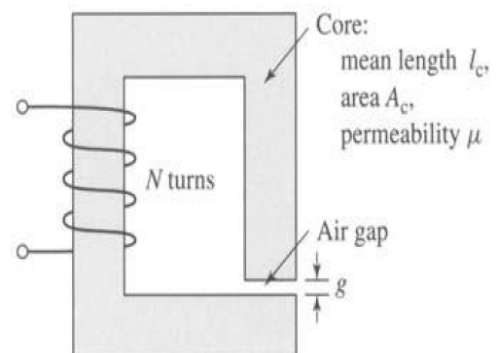
b. A magnetic circuit with a single air gap is shown in given figure. The core dimensions are:

$$\text{Cross-sectional area } A_c = 1.8 \times 10^{-3} \text{ m}^2$$

$$\text{Mean core length } l_c = 0.6 \text{ m}$$

$$\text{Gap length } g = 2.3 \times 10^{-3} \text{ m}$$

$$N = 83 \text{ turns}$$



Assume that the core is of infinite permeability ($\mu \rightarrow \infty$) and neglect the effects of fringing fields at the air gap and leakage flux. (a) Calculate the reluctance of the core R_c and that of the gap R_g . For a current of $i = 1.5$ A, calculate (b) the total flux ϕ , (c) the flux linkages λ of the coil, and (d) the coil inductance L . (8)

Q.3 a. What is Step-Up transformer? Derive an expression for the EMF equation of a transformer. (2+6)

b. An ideal 25 kVA transformer has 500 turns on the primary winding and 40 turns on the secondary winding. The primary is connected to 3000 V, 50 Hz supply. Calculate
 (i) primary and secondary currents on full-load
 (ii) secondary e.m.f. and
 (iii) the maximum core flux (4+2+2)

Q.4 a. Explain armature reaction. Explain different methods to reduce armature reaction. (4+4)

b. A 230 volts dc shunt motor runs at 1000 rpm when the armature current is 35 A. The resistance of the armature circuit is 0.3Ω . Calculate the additional resistance required in the armature circuit to reduce the speed of the motor to 750 rpm, assuming that the armature current is 25 A. (8)

Q.5 a. Draw suitable phasor diagram of synchronous motor operating at different power factors. (8)

b. A 3300 Volts, delta connected motor has a synchronous reactance per phase (delta) of 18 ohm. It operates at a leading power factor of 0.707 when drawing 800 kW from the mains. Calculate its excitation emf. (8)

Q.6 a. Draw the torque speed characteristics of a 3-phase induction machine and clearly indicate the effect of change in rotor resistance on characteristics of motor. (3+6)

b. If the motor is fed from a 50 Hz 3 phase supply and its synchronous speed is 1000 RPM and full load speed is 950 RPM, calculate
 (i) number of poles
 (ii) slip at full load
 (iii) frequency of rotor voltage
 (iv) speed of rotor field wrt rotor
 (v) speed of rotor field wrt to stator
 (vi) speed of rotor field wrt stator field
 (vii) speed of rotor at a slip of 10 percent (7)

Q.7 a. Why auxiliary winding is required in single phase motors? Discuss field of applications of fractional kW motors. (5+3)

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- b. With a neat diagram explain the working of a universal motor. Also draw its torque-speed characteristics when it is fed from both ac & dc sources. (8)
- Q.8** a. What are the various merits and limitation of HVDC transmission over the conventional AC transmission? (8)
- b. Differentiate between feeder, distributor and service main with suitable diagram. (8)
- Q.9** a. Write name of different type of earthing. How it works? (8)
- b. Classify electrical and electronics instruments. (8)