

AMIETE – ET (New 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. Right Hand rule for determining the direction of induced EMF was introduced by:
- (A) Faraday (B) Lenz
(C) Fleming (D) Maxwell
- b. A transformer steps up the voltage by a factor of 100. The ratio of current in the primary to that in the secondary is
- (A) 1 (B) 0.01
(C) 100 (D) 0.1
- c. The EMF induced in the dc generator armature winding is
- (A) AC (B) DC
(C) AC & DC (D) None of these
- d. Shunt field of DC generators consists of _____ number of turns and _____ conductors respectively.
- (A) Large and thick (B) Large and thin
(C) Less and thick (D) Less and thin
- e. In DC machine torque depends on which of the following?
- (A) Flux (ϕ) (B) Armature current (I)
(C) Both A and B (D) Speed
- f. Advantages of higher transmission voltage is/are
- (A) Power transfer capability of the transmission line is increased
(B) Transmission line losses are reduced
(C) Area of cross section and volume of the conductor is reduced
(D) All of these

Code: AE105 Subject: PRINCIPLES OF ELECTRICAL ENGINEERING

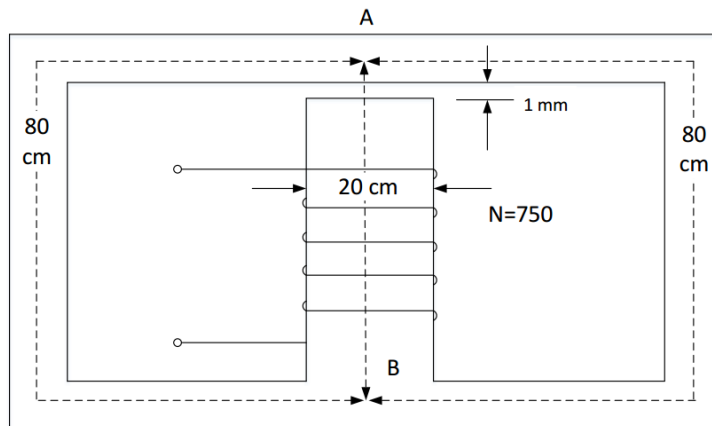
- g. For a 3-phase, 4-pole, 50 Hz synchronous motor the frequency, pole number and the load torque are halved. The motor speed will be
 (A) 375 rpm (B) 1,500 rpm
 (C) 75 rpm (D) 3,000 rpm
- h. In an induction motor, the air gap flux density is usually kept low so as to
 (A) Improve efficiency (B) Improve power factor
 (C) Reduce machine cost (D) None of these
- i. If the rotor circuit resistance is increased in an induction motor, the maximum torque will occur at
 (A) Lower speed (B) High speed
 (C) Same speed (D) None of these
- j. The internal resistance of milliammeter must be very low for
 (A) High sensitivity
 (B) High accuracy
 (C) Maximum voltage drop across the meter
 (D) Minimum effect on the current in the circuit

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

Q.2 a. Write short notes on: (2.5x4)

- (i) Faraday's Law
 (ii) Lenz's Law
 (iii) Statically Induced EMF
 (iv) Dynamically Induced EMF

- b. In the magnetic circuit shown in figure below, the area of cross-section of the central limb is 12 cm^2 and that of each outer limb (A to B) is 6 cm^2 . A coil current 0.5 A produces 0.5 mWb in the air-gap. Find the relative permeability of the core material. Ignore leakage and fringing. (6)



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- Q.3** a. What is Ideal Transformer? Draw its phasor diagram on No Load & Loaded condition. (5)
- b. Explain Voltage Regulation of a Transformer. (5)
- c. List the tests used to determine the parameters of circuit model of transformer. Explain them briefly. (6)
- Q.4** a. Write a note on Speed control of DC Shunt motor by: (4x2)
- (i) Field Control
- (ii) Armature Control
- b. In a 100 kW, 600 V, 1200 rpm shunt motor, the field resistance is 500 Ω and the armature and brush resistance is 0.13 Ω . The efficiency of the motor at rated output and speed is 90%. Find: (8)
- (i) The Line current
- (ii) The field current
- (iii) Induced EMF
- (iv) Mechanical Power developed
- Q.5** a. Draw V-curves for both synchronous motor and generator operating at constant load under variable excitation. Also indicate Stability on the curve. (6)
- b. A DC shunt motor rated 39.6 kW connected to a 220 V supply is loaded as to draw 180A when running at a speed of 1200 rpm. Given armature resistance 0.3 Ω . (5x2)
- (i) Determine the load torque if the rotational loss (including iron loss) is 880 W.
- (ii) Determine the motor efficiency if the shunt field resistance is 120 Ω .
- Q.6** a. Draw the Torque-Speed characteristics of Induction motor indicating various operating modes. Also explain the various operating modes. (8)
- b. A 4-pole, 50 Hz, 3-phase Induction motor when running on full load develops a useful torque of 150 Nm while the rotor EMF is observed to make 60 cycles/min. It is known that the torque lost on account of friction and core loss is 10 Nm. The total core loss is given as 500 W. Calculate: (2x4)
1. Shaft power output
 2. Rotor copper loss
 3. Motor input
 4. Motor efficiency
- Q.7** a. Write a short note on Capacitor split-phase motor. (5)
- b. Explain briefly: (3x2)
1. Reluctance motor
 2. Hysteresis motor
- c. Explain working of universal motor with the help of circuit diagram. (5)

Q.8 a. Write the advantages & disadvantages of HVDC Transmission. **(6)**

b. A single phase 50 Hz generator supplies an inductive load of 5000 kW at a p.f. of 0.707 lagging by means of an overhead transmission line 20 km long. The line resistance and inductance are 0.0195Ω and 0.63 mH per km. the voltage at the receiving end is required to be kept constant at 10 kV. Find: **(10)**

1. The sending end voltage.
2. Voltage regulation of the line
3. Transmission efficiency.

Q.9 a. Explain briefly: **(2x3)**

1. Permanent magnet moving coil instruments
2. Electro dynamo meter
3. Moving iron instruments

b. Explain the various methods of earthing **(4)**

c. The saw tooth waveform of fig. given below is applied to an average responding voltmeter with a scale calibrated in terms of the RMS value of a sine wave. Calculate the error in the meter indication. **(6)**

