

## AMIETE - ET (NEW SCHEME)

Time: 3 Hours

**DECEMBER 2011**

Max. Marks: 100

**NOTE: There are 9 Questions in all.**

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- 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. Two parallel wires carrying currents in the same direction attracts each other because of the

- (A) potential difference between them (B) mutual difference between them  
(C) electric force between them (D) magnetic force between them

b. Can a transformer work on d.c?

- (A) It will work equally as well as a.c  
(B) It will not work on d.c  
(C) It will work on d.c if the voltage applied is less than 10 V  
(D) It will work on d.c only if the voltage applied is more than 440 V

c. If the full load copper loss of a transformer is 1000 W, what will be its copper loss at half-load?

- (A) 1000 W (B) 2000 W  
(C) 500 W (D) 250 W

d. It is desired to rotate a d.c shunt motor at 1200 rpm which is rated to rotate at 1000 rpm. What method of speed control will be suitable?

- (A) Armature control method  
(B) Field control method  
(C) Any one of (A) and (B) can be used  
(D) Both (A) and (B) are to be used simultaneously

e. A d.c series motor should always be started with load because

- (A) at no load it will rotate at dangerously high speed  
(B) at no load it will not develop high starting torque  
(C) it cannot start without load  
(D) it draws a small amount of current at no load

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- f. A 4-pole, 1200 rpm alternator will generate emf at a frequency of \_\_\_\_\_
- (A) 60 Hz (B) 50 Hz  
(C) 40 Hz (D) 25 Hz
- g. The slip of an induction motor under full-load condition is about
- (A) 0.03 (B) 0.10  
(C) 0.20 (D) zero
- h. In a “capacitor-start, capacitor-run” motor the two capacitors \_\_\_\_\_
- (A) are of same types (B) are of different types  
(C) have equal capacitance (D) are disconnected when the motor attains full speed
- i. Which of the following is/are the renewable source of energy?
- (A) Wind (B) Coal  
(C) Solar (D) Both (A) and (C)
- j. The advantages of HV DC transmission system is/are
- (A) There is no charging current (B) No harmonics are generated  
(C) No reactive power is required (D) Both (A) and (B)

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

- Q.2** a. Derive an expression for hysteresis loss in a magnetic material. Explain the factors on which it depends. (8)
- b. The total core loss of a specimen of silicon steel is found to be 1500 Watt at 50 Hz. Keeping the flux density constant, the loss becomes 3000 Watt when the frequency is raised to 75 Hz. Calculate separately the hysteresis and eddy current loss at each of these frequencies. (8)
- Q.3** a. Derive the condition under which a transformer has maximum efficiency. (8)
- b. A 2500/250 V, 25 kVA transformer has a core loss of 130 W and full load copper loss of 320 W. Calculate the efficiency at full load when it is operating at 0.8 pf lagging. (8)
- Q.4** a. Explain why a starter is needed for d.c shunt motor. (8)
- b. A d.c series motor operates at 800 rpm with a line current of 120 A from 250 V mains. Determine the speed of motor drawing current of 60 A at 250 V, assuming that the flux/pole at 60 A is 70% of its value at 120 A. Given :  
 $R_a = 0.15 \Omega$ ,  $R_{Se} = 0.1 \Omega$ . (8)

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- Q.5** a. Explain 'power-angle' characteristic of a synchronous machine. (8)
- b. A 3-phase synchronous motor is synchronised to the mains at a terminal voltage of 12.5 kV. It has a synchronous reactance of  $8.0\Omega$ . Assuming that the motor is unloaded and neglecting the rotational losses, draw the phasor diagram and compute the current, active power, reactive power drawn from the supply mains and the power factor, if the field current is raised to increase the machine excitation by 20%. (8)
- Q.6** a. Explain 'star-delta' method of starting a 3-phase induction motor. (8)
- b. A 12-pole, 50 Hz, 3-phase induction motor runs at 485 rpm. Calculate the frequency of rotor-current. (8)
- Q.7** a. Explain the working principle of single phase, split-phase motor. (8)
- b. Explain the principle of operation for two valve capacitor motor. (8)
- Q.8** a. State the Energy Conversion principle for solar power, wind power & bio fuels. (8)
- b. Give a brief account of environmental impacts of electricity generation using coal as fuel. (8)
- Q.9** Explain the principle of HVDC transmission also discuss its advantages and limitations. (16)