Code: AE105   Subject: PRINCIPLES OF ELECTRICAL ENGINEERING

AMIETE – ET {NEW SCHEME}

Time: 3 Hours   **DECEMBER 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. If a transformer primary is energised from a square wave voltage source, its output voltage will be

   (A) A square wave   **(B)** A sine wave
   (C) A triangular wave   **(D)** A pulse wave

b. 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

c. The maximum power for a given excitation in a synchronous motor is developed when the power angle is equal to

   (A) 0° **(B)** 45°
   (C) 60° **(D)** 90°

d. The only disadvantage of field control method for controlling the speed of dc shunt motor is that it

   (A) gives speed lower than the normal speed
   (B) is wasteful
   (C) needs a large rheostat
   (D) adversely affects commutation

e. As the voltage of transmission increases, the volume of conductor

   (A) increases   **(B)** does not change
   (C) decreases   **(D)** increases proportionately

f. An alternator is delivering rated current at rated voltage and 0.8 power-factor lagging case. If it is required to deliver rated current at rated voltage and 0.8 power-factor leading, the required excitation will be

(**A**) less   (**B**) more
(**C**) more   (**D**) the same

g. In case of a universal motor, torque pulsation is minimized by _____.

(**A**) load inertia   (**B**) rotor inertia
(**C**) both rotor and load inertia (**D**) none of these

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. The major disadvantage of hydrogen energy system refers to hydrogen _____.

(**A**) production   (**B**) storage
(**C**) transmission   (**D**) calorific value

j. Which of the following is/are the renewable source of energy?

(**A**) Wind   (**B**) Coal
(**C**) Solar   (**D**) Both (**A**) and (**C**)

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

Q.2 a. An iron has 15cm diameter and 10 cm^2 cross-sectional area, wound with 200 turns of wire. For flux density of 1 Wb/m^2 and permeability of 500, find the exciting current. **(8)**

b. What is meant by Self Induced EMF? Derive an expression for the coefficient of self induction. **(8)**

Q.3 a. Define voltage regulation of a transformer. Deduce an expression for voltage regulation. **(8)**

b. A 250 KVA, 1100 V / 400 V, 50 Hz single-phase transformer has 80 turns on a secondary. Calculate:
a) the approximate values of the primary and secondary currents.
b) the approximate number of primary turns.
c) the maximum values of flux **(8)**

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Q.4 a. What is starter? Explain the necessity of starter for a dc motor.   **(8)**

  b. A 240-V, 20 HP, 850 r.p.m., shunt motor draws 72A when operating under rated conditions. The respective resistance of the armature and shunt field is 0.242 Ohm and 95.2 Ohm, respectively. Determine the percent reduction in the field flux required to obtain a speed of 1650 r.p.m., while drawing an armature current of 50.4 A   **(8)**

Q.5 a. Write the expression for the induced emf and torque of a dc machine using standard symbols. What is machine constant?   **(8)**

  b. A 4-pole dc machine has an armature radius of 14.5 cm and active length 21 cm. The pole area is 70% of pole pitch. Average flux density under poles is 0.8T. The armature has 33 slots, 33 coils with a turn/coil. Determine the following: **(8)**
  (i) The armature constant K_a
  (ii) The armature induced emf E_a
  (iii) The conductor current when the armature carries a current of 240A
  (iv) The torque and mechanical power developed at the armature current of 240A

Q.6 a. Discuss the working principle of three phase induction motor.   **(10)**

  b. The power input to the rotor of a 3-phase, 50 Hz, 6 Pole induction motor is 80 kW. The rotor emf makes 100 complete alternations per minute. Find :
  (i) the slip
  (ii) rotor frequency
  (iii) the mechanical power developed by the motor   **(6)**

Q.7 a. Why single phase induction motors are not self starting?   **(10)**

  b. Explain AC Series motor or Universal motor in brief.   **(6)**

Q.8 a. What is the concept of power transmission? Develop the circuit model of 3-phase transmission line.   **(8)**

  b. What are different levels of voltages used for generation, transmission and distribution of electric power?   **(8)**

Q.9   Write notes on any **TWO** of the following:-   **(2 x 8)**
   (i) Types of Wiring
  (ii) Types of Indicating Instruments
  (iii) Various methods of measurement of Electronic components