ROLL NO. _____

Code: AE10 **Subject: ELECTRICAL ENGINEERI**

AMIETE – ET (OLD SCHEME)

Time: 3 Hours **JUNE 2012** **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. As the voltage of transmission increases, the volume of conductor

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

b. The voltages induced in the three windings of a three phase alternator are ____ degree apart in three phases

(A) 120° **(B)** 60°
(C) 90° **(D)** 30°

c. As the load is increased, the speed of dc shunt motor

(A) increases proportionally. **(B)** remains constant.
(C) increases slightly. **(D)** reduces slightly.

d. A universal motor is one which

(A) is available universally
(B) can be marketed internationally
(C) can be operated either in "AC" or "DC" power supply
(D) runs at dangerously high speed at no-load

e. A stepper motor is a / an _____ device

(A) mechanical **(B)** incremental
(C) analogue **(D)** All of the above

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f. The cost of power generation is lowest in

(A) Thermal power generation **(B)** Nuclear power generation
(C) Hydro power generation **(D)** Diesel power generation

g. EMF of d.c. generator with "P" no. of poles and "A" no. of parallel paths, depends on

(A) flux **(B)** speed
(C) both **(A)** & **(B)** **(D)** torque

h. A three phase, 2 pole, 50 Hz, the rotating field of synchronous motor runs at a speed of

(A) 3000 RPM **(B)** 1440 RPM
(C) 60 RPM **(D)** 40 RPM

i. DC series motor are always run

(A) with load **(B)** without load
(C) half load **(D)** no load

j. Efficiency of transformer is maximum when

(A) copper loss is greater than iron loss **(B)** copper loss is lesser than iron loss
(C) copper loss equals to iron loss **(D)** copper loss is half of iron loss

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

Q.2 a. Define voltage regulation of a transformer and derive the condition on power factor of the load for regulation to be zero. **(8)**

b. A 20 kVA, 50 Hz, 2000/200 V distribution transformer has a leakage impedance of (0.42+ j0.52) Ω in the high voltage (HV) winding and (0.004 +j0.05) Ω in the low voltage (LV) winding. When seen from the LV side, the shunt branch admittance Y_O is (0.002 +j 0.015) mho at rated voltage and frequency. Draw the equivalent circuit referred to (i) HV side (ii) LV side, indicating all impedances on the circuit. **(8)**

Q.3 a. Explain the principle of operation of synchronous generator. Discuss types of rotor used in synchronous machines. **(8)**

b. The full load current of a 3.3 kV, star connected synchronous motor is 160 A, 0.8 pf lagging. The resistance and synchronous reactance of the motor are 0.8 Ω and 5.5 Ω per phase respectively. Calculate the excitation emf,

torque angle, efficiency and shaft output of the motor. Assume the mechanical stray load loss to be 30 kW. **(8)**

Q.4 a. Explain any two methods for speed control of dc series motor. **(8)**

b. A 410 V dc shunt motor takes a current of 5.6 A on no-load and 68.3 A on full-load. Armature reaction weakens the field by 3%. Calculate the ratio of full-load speed to no-load speed. Given Armature resistance $R_a = 0.18\,\Omega$, brush voltage drop=2V, field resistance $R_f = 200\ \Omega$. **(8)**

Q.5 a. Discuss various method for starting of 3-ϕ squirrel cage induction motor. **(8)**

b. A 440 V, 50 Hz, 4-pole 3 phase, delta-connected induction motor has a leakage impedance of (0.3 +j 5.5+0.25/s)Ω/phase (delta phase) referred to the stator. The stator to rotor voltage ratio is 2.5. Determine the external resistance to be inserted in each star-phase of the rotor winding such that the motor develops a gross torque of 150 Nm at a speed of 1250 rpm. **(8)**

Q.6 a. Explain the construction and working of ac tachometer and give its application **(8)**

b. Explain with a neat sketch, the construction and principle of stepper motor. Discuss its main fields of application. **(8)**

Q.7 a. Draw a neat sketch of a Hydro Electric power plant station and explain the function of each component. **(12)**

b. Write the main features of solar energy? Explain a suitable method by which solar energy can be converted into electric energy? **(4)**

Q.8 a. Explain with neat diagram the schemes used for power system protection. **(8)**

b. Discuss various types of relays used in power system protection. **(8)**

Q.9 Write a short notes on
(i) Eddy current heating.
(ii) Electric welding. **(8×2)**