Code: DE05 **Subject: ELECTRICAL ENGINEERING**
Time: 3 Hours **Max. Marks: 100**

DECEMBER 2010

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 half an hour 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: (2x10)

a. The super - position theorem is applicable to:

(A) Current only **(B)** Voltage only.
(C) Both current and voltage **(D)** Current, voltage and power.

b. The difference between the synchronous speed & the actual speed of an induction motor is known as :

(A) Regulation **(B)** Back lash
(C) Slip **(D)** Lag

c. A step up transformer increases

(A) Power **(B)** Power factor
(C) Voltage **(D)** Frequency

d. Which d.c. motor has approximately constant speed?

(A) Series motor
(B) Shunt motor
(C) Cumulatively compound motor
(D) All of the above

e. For three phase star connected circuit

(A) Line voltage = Phase Voltage
(B) Line current = Phase current
(C) Line current =$\sqrt{3}$ Phase current
(D) none of the above

f. A synchronous motor can operate at

(A) Lagging power factor only
(B) Leading power factor only
(C) Unity power factor only.
(D) lagging, leading and unity power factor

g. In an a.c. circuit, the current

(A) is always in phase with the e.m.f.
(B) always leads the e.m.f.
(C) always lags the e.m.f.
(D) Any of the above depending upon the element (L, C, or R) of the circuit

h. The speed of a DC motor maybe varied by varying

(A) Field current
(B) Applied voltage.
(C) Resistance in series with armature
(D) Any of the above

i. what will happen if the back emf of a dc motor suddenly vanishes

(A) The motor will run faster than the rated speed
(B) The motor will start hunting
(C) The efficiency of motor will rise abruptly.
(D) The motor will burn

j. While the pole flux of d.c shunt generator remains constant the speed is doubled. The emf generated will be

(A) four times **(B)** double
(C) unchanged **(D)** halved

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

Q.2 a. State and explain Kirchhoffs laws? **(8)**

b. A circuit has a resistance of R Ω in series with an inductance of L Henries. With a supply of 240V, 50Hz the power in the circuit is 300W and the voltage across R is 100V. Find the value of L. **(8)**

Q.3 a. Derive the E.M.F equation of d c motor? **(8)**

b. The armature of a 4 pole dc machine is required to generate an emf of 520V on open circuit when revolving at a speed of 660rpm. Calculate the magnetic flux per pole required if the armature has 144 slots with 2 coil sides per slot each coil consisting of three turns. The armature is wave wound **(8)**

Q.4 a. Explain the working principle of operation of a single phase transformer. **(6)**

b. A 50kVA , 5000/500V, 50Hz, 1-phase transformer has the high voltage winding with a resistance of 8 Ω and low voltage winding with a resistance of 0.06 Ω . The no load losses of the transformer amount to 1000W. Calculate the efficiency of the transformer when delivering its full rated output at a power factor of 0.8. **(10)**

Q.5 a. Explain the principle of operation of 3-phase induction motor? **(8)**

b. A 12 pole , 3-phase alternator driven at a speed of 500 rpm supplies power to a 8-pole, 3-phase induction motor. If the slip of the motor at full load is 3%, calculate the full load speed of the motor. **(8)**

Q.6 a. What factors are considered for the selection of motor for specific engineering application? **(8)**

b. Explain application and advantages of storage batteries? **(8)**

Q.7 a. Explain the term **(8)**
(i) Demand factor
(ii) Maximum demand
(iii) load Factor
(iv) Diversity factor

b. What are the advantages of high voltage transmission ? Explain **(8)**

Q.8 a. What are the different methods of improvement of power factor **(8)**

b. Explain various modes of power generation ? **(8)**

Q.9 Write short notes on

(i) Resonance in R-L-C series circuit. **(8)**
(ii) speed control of D.C shunt motors **(8)**