DECEMBER 2007

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

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.**
- **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 best alternative in the following. (2x10)

a. Which DC motors has approximately constant speed?

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

b. Which of the following bulbs will have the least resistance?

(A) 220V, 60W **(B)** 220 V, 100 W
(C) 115 V, 60 W **(D)** 115V, 100 W

c. Resistance of a wire is r ohms. The wire is stretched to double its length, then its resistance in ohms is

(A) r/2 **(B)** 4r
(C) 2r **(D)** r/4

d. An electric machine will have high efficiency when

(A) input/output ratio is low **(B)** reactive power is more
(C) kWh consumption is low **(D)** losses are low

e. Which type of loss is not common to transformers and rotating machines?

(A) Eddy current loss **(B)** Copper loss
(C) Hysteress loss **(D)** Windage loss

f. The difference between the synchronous speed and the actual speed of an induction motor is known as

(A) Regulation **(B)** back lash
(C) slip **(D)** lag

g. In two wattmeter method of power measurement, if one of the wattmeter shows zero reading, then it can be concluded that

(A) Power factor is unity **(B)** Power factor is zero
(C) Power factor is 0.5 lagging **(D)** Power factor is 0.5 leading

h. Which of the following will remain the same in all parts of a series circuit?

(A) Voltage **(B)** Current

(C) Power **(D)** Resistance

i. Which single phase motor would you select for a tape recorder?

(A) Reluctance motor **(B)** Hysteresis motor
(C) Synchronous motor **(D)** Universal motor

j. The demand factor for the electrical system is the ratio of

(A) Maximum demand to connected load
(B) Maximum demand to average load
(C) Average power to maximum power

(D) Relative power to total power

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

Q.2 a. What are the different network theorems? State Thevenin's theorem. **(6)**

b. Using Thevenin's theorem, find the current through 2.5 ohms resistance in the circuit shown in the FIG-1 **(10)**

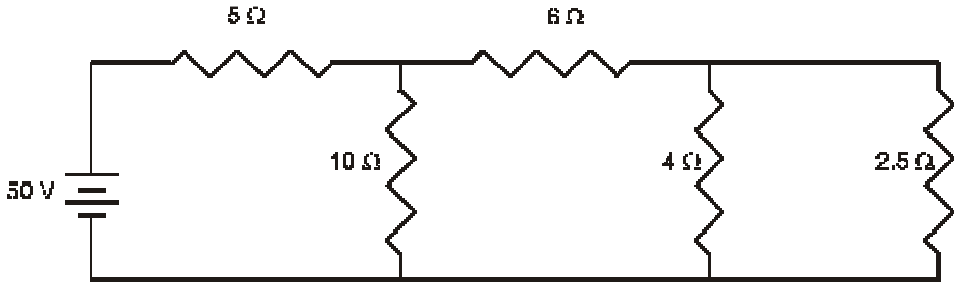

FIG - 1

Q.3 a. What are the different methods of measurement of power in 3-phase circuit. Explain two wattmeter method in brief. **(8)**

b. An a.c circuit consists of a pure resistance of 10 ohms and is connected across an a.c supply of 230V, 50 Hz.

Determine (i) current flowing through the circuit.

(ii) Power consumed by the circuit.

(iii) Write down the equation for voltage and current. **(8)**

Q.4 a. What are the different types of D.C motors? Give their applications? **(8)**

b. The armature of a 4-pole, d.c shunt motor has a lap-connected armature winding with 740 conductors. The no load flux per pole is 30 mwb. If the armature current is 40A, determine the torque developed? **(8)**

Q.5 a. Explain the working principle of operation of a single phase transformer. **(6)**

b. A 50 kVA , 5000/500V, 50Hz, 1-phase transformer has the high voltage winding with a resistance of 8 ohms and low voltage winding with a resistance of 0.06 ohms. 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.6 a. Name the different types of 1-phase A.C motors. Give some important application of these motors. **(8)**

b. Why single phase induction motor are not self starting? **(8)**

Q.7 a. Explain application and advantages of storage batteries? **(10)**

b. A 3-Phase induction motor is wound for 4-poles and is supplied from a 50 Hz system.

Calculate (i) Synchronous speed
(ii) The speed of the rotor when the slip is 4%
(iii) The rotor frequency when the rotor runs at 1200 rpm. **(6)**

Q.8 a. Define the following:
(i) Average demand
(ii) Maximum demand
(iii) Demand factor.

(iv) Load factor. **(8)**

b. If a generating station has a maximum load for the year of 18,000 kW and a load factor of 30.5% and the maximum loads on the substations were 7500 kW, 5000 kW, 3400 kW, 4600 kW and 2800 kW. Calculate the units generated for the year and diversity factor of the generating station. **(8)**

Q.9 Write short notes on

(i) Different losses in transformer. **(8)**

(ii) Resonance in R-L-C series circuit. **(8)**