Roll No. ...

EC–402

B. E. (Fourth Semester) EXAMINATION, Dec., 2011

(Electronics & Communication Engg. Branch)

CONTROL SYSTEMS

(EC – 402)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt *one* question from each Unit. All questions carry equal marks. Assume suitable data if missing.

Unit – I

1. A 50 Hz, 2-phase A. C. servomotor has the following parameters :

   Starting torque = 0·186 Nm

   Rotor inertia = 1×10^{-5} kg-m^2

   Supply voltage = 120 volts

   No load angular velocity = 304 rad/sec.

   Assume straight-line torque-angular speed characteristics of the motor and zero viscous friction, derive the transfer function.

. (a) Explain scott connection for 3-phase to 2-phase conversion.

(b) Two single phase Transformers with equal turn have impedance of (0.5+j3) ohms and (0.6+j10) ohms with respect to the secondary. If they operate in parallel, determine how they will share total load of 100 KW at p.f 0.8 lagging?

. (a) Explain different methods of excitation of d.c. generators with suitable diagrams.

(b) A six pole d.c. machine armature has 36 slots, 2 coil-sides/ slot, 8 turns/coil and is wave wound. The pole shoe is 18cm. long and the mean air gap diameter is 25cm. The average flux density over one pole pitch is 0.8T. Find the gross torque and mechanical power output when the machine is operating as a motor at 1200 rpm with an armature input current of 10A.

4. (a) Explain the armature reaction in d.c. generator on no load and on load. Briefly explain the methods to over come the adverse effects of the armature reaction.

(b) In a 50 KW, 230/250V (230V on load and 250V on full load) over compound d.c. generator the flux per pole required to produce 230V on no load at 1050 rpm is 0.06 wb. The resistances of the armature and series field are 0.04Ω and 0.01Ω respectively and the shunt field resistance is 100Ω. Calculate the value of flux per pole at full load 1000 rpm. Neglect brush drop.

5. (a) Describe the manner in which the speed of a series d.c. motor can be achieved electronically through use of a S.C.R.

(b) A d.c. shunt machine when run as a motor on no-load takes 400W at 220V and runs at 1000 rpm. The field current is 1.0A and armature resistance is 0.5Ω. Calculate the efficiency when motor taking 40A from the supply of 220V.

6. (a) What is Hopkinson's test and why is it called regenerative test? Draw connection diagram to conduct this test.

(b) A 230V d.c. shunt motor has an armature resistance of 0.1Ω and shunt field resistance of 275Ω. It runs at speed of 1000 rpm when drawing an armature current of 75A. Calculate the additional resistance to be inserted in the field circuit to raise the motor speed 1200rpm at an armature current of 125A. Assume linear magnetization characteristics.

7. (a) Draw the complete equivalent circuit of the three phase induction motor and explain the meaning of each parameter and electrical variable appearing in the circuits.

(b) By means of a power flow diagram show the flow of power in a three phase induction motor from the electrical source to the mechanical load at the motor shaft.

8. (a) Sketch the torque-speed curve of the induction motor and show how the basic torque equation can be used to explain the shape taken.