Code No. 3116

## FACULTY OF ENGINEERING

### B.E. 4/4 (E&EE) I-Semester (Supplementary) Examination, June/July 2011

### ELECTRIC DRIVES AND STATIC CONTROL

Time : Three Hours]                                                    [Maximum Marks : 75

*Note :—Answer ALL questions from Part—A. Answer any FIVE questions from Part—B.*

### PART—A (Marks : 25)

1.  List at least four advantages of electric drives.                          2

2.  What are the components of load torque ?                                    2

3.  The energy dissipated in case of dc shunt motor is dependent on armature resistance. State whether this is true or false. Substantiate it.                          3

4.  What do you mean by 'load equalisation' and how is it being achieved ?      3

5.  Draw the characteristics of maximum torque and power limitations of DC drives operating with combined armature voltage and field control.                          3

6.  What are the control strategies for varying duty cycle of the chopper ?     2

7.  Constant torque loads are not suitable for AC voltage controller fed Induction motor drive. Why ?                                                                      2

8.  What happens to the performance of AC motor if the stator voltage control technique is adopted with frequency being constant ?                          3

9.  Give the advantages of using cycloconverter for synchronous motor speed control.  3

10. Classify the various types of synchronous motor.                            2

### PART—B (Marks : 50)

11. (a)  Show that the speed torque curves of passive torque loads are confined to the first and third quadrants only while those of active torque loads can range over all four quadrants.     5

    (b)  Sketch the seven possible cases of the load torque curve and motor torque curve with torque on X-axis and speed on Y-axis and determine the stability of each.                          5

HVS—861                                    1                                    (Contd.)

12. (a) Discuss briefly about the methods to reduce the energy loss during starting. 5

    (b) A 10 kW, 3-phase, 400 V, 20 A, 50 Hz 960 rpm, 0.8 power factor SCIM drives a certain load. The total moment of Inertia of the drive is 0.5 kg-m$^2$ :

      (i) Determine the number of starts per minute that this drive can make under no load conditions without exceeding the total power dissipated in the moter under rated conditions.

      (ii) How many starts per minute could be made if the rated speed were 1440 rpm, all other conditions remaining same.

      Assume a stator to rotor resistance ratio as unity and neglect magnetizing current and rotational losses. 5

13. Explain the motoring and braking operation of the three phase fully controlled rectifier control of dc separately excited motor with aid of diagrams and waveforms. Also obtain the expression for motor terminal voltage and speed. 10

14. (a) Compare VSI fed drive with a CSI fed drive. 5

    (b) A 3-$\phi$ SCIM is developing a torque of 1500 synchronous watts at 50 Hz and 1440 rpm. (Synchronous speed is 1500 rpm). If the motor frequency is increased to 75 Hz using constant power mode, determine the new value of torque developed by the motor at constant slip. 5

15. Explain the self control of synchronous motor fed from VSI. Discuss briefly about the separately controlled. Synchronous motor fed from VSI. Compare the above two schemes. 10

16. (a) Describe briefly about the ratings of motors for different applications. 5

    (b) Determine the half hour rating of a 25 kW motor having a time constant of 1.5 hours. Assume that the motor cools down completely between each load period and that the iron losses which remain constant are 90 percent of copper losses at full load. 5

17. Give a brief treatise on the following :

    (a) Brushless DC Motor.

    (b) Switched Reluctance Motor. 5

       5