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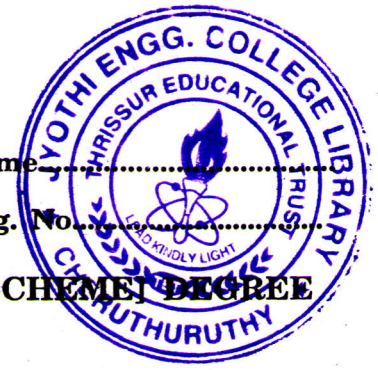
SEVENTH SEMESTER B.TECH. (ENGINEERING) [2014 SCHEME] DEGREE EXAMINATION, NOVEMBER 2017

Electrical and Electronics Engineering

EE 14 703—ELECTRIC DRIVES

Time : Three Hours   Maximum : 100 Marks

Part A

*Answer any **eight** questions.*
Each question carries 5 marks.

1. Draw the characteristics of different types of loads and explain.

2. Describe the various types of converters employed in drives.

3. Explain the factors on the choice of an electrical drive.

4. What is dynamic braking ? Explain its speed torque curves of series motor.

5. Explain why the field control is considered superior to armature resistance control for DC shunt motors.

6. Explain time ratio control and current limit control.

7. Justify why stator voltage control is suitable for speed control of induction motors in fan and pump drives.

8. Compare vector control and V/f control.

9. Explain when can a synchronous motor be load commutated.

10. Draw and explain a unipolar drive circuit of variable reluctance motor.

(8 × 5 = 40 marks)

Part B

*Answer any **four** questions*
Each question carries 15 marks.

11. (a) (i) Label the essential parts of electric drive. Explain its function.   (7 marks)

     (ii) Explain the speed-torque conventions used in multi-quadrant operation.   (8 marks)

Or

  (b) (i) Explain the four quadrant operation of low speed hoist in detail.   (8 marks)

     (ii) Explain and derive an equation to find out equivalent load torque in a motor load system with translational and rotational motion.

(7 marks)

Turn over

12. (a) Explain the steady-state analysis of the single-phase fully controlled converter fed separately excited DC motor drive for continuous current mode. Also explain its operation in motoring and regenerative braking mode.

Or

(b) (i) Explain the operation of four quadrant DC chopper drive.   (8 marks)

(ii) A d.c. chopper is used to control the speed of a d.c. series motor. The DC input voltage is 600 V, armature resistance Ra = 0.04 Ω, field circuit resistance Rf = 0.06 Ω and motor back e.m.f. constant kv = 35 mV/rad./sec. The motor drives a constant load torque of Td = 547 N-m, plot the motor speed against the duty cycle k of the chopper.

(7 marks)

13. (a) (i) Describe the variable frequency operation of induction motor in closed loop with constant airgap flux.

(8 marks)

(ii) A three-phase, 56 kW, 4000 r.p.m., 460 V, 60 Hz, 2 pole, star connected induction motor has the following parameters :

Rs = 0.2 Ω, Rr' = 0.18 Ω, Xs = 0.13 Ω, Xr' = 0.23 Ω and Xm = 11.4 Ω.

The motor is controlled by a constant v/f. Calculate (i) The maximum torque and the corresponding speed for 60 Hz and 30 Hz ; (ii) Calculate the maximum torque if Rs is negligible.

(7 marks)

Or

(b) Explain the four mode of operation of static Scherbius drive with diagram.

14. (a) (i) Explain margin angle control of synchronous motor drive.   (10 marks)

(ii) Write short notes on reluctance motors.   (5 marks)

Or

(b) (i) Describe a bipolar drive for stepper motors. Which stepper motors need bipolar drives?

(8 marks)

(ii) Describe the operation of a bridge converter used for switched reluctance motor.

(7 marks)

[4 × 15 = 60 marks]