

Reg. No.

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B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Sixth Semester

EE16602 – SOLID STATE DRIVES AND TRACTION*(Electrical and Electronics Engineering)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**Answer **ALL** questions**PART A - (10 X 2 = 20 Marks)**

| | | CO | RBT |
|-----|--|-----------|------------|
| 1. | Draw the load torque characteristics of constant power loads. | 1 | AP |
| 2. | Based on the calculation of motor rating what are the classes of motor duty? | 1 | U |
| 3. | What are the drawbacks of rectifier fed dc drives? | 2 | AP |
| 4. | Distinguish between CLC and TRC in chopper fed drives? | 2 | AP |
| 5. | What are the advantages of closed loop speed control? | 3 | U |
| 6. | What are the factors to be considered for the selection of a controller? | 3 | U |
| 7. | How is the speed controlled in induction motor? | 4 | U |
| 8. | Mention the main difference between the wound field and permanent magnet synchronous motors. | 4 | AP |
| 9. | Define tractive effort also give the expression for total tractive effort. | 5 | U |
| 10. | List the advantages and disadvantages of electric traction. | 5 | U |

PART B - (5 X16 = 80 Marks)

11. (a) (i) With neat diagram explain the multi-quadrant operation of an electric motor driving a hoist load. **(8)** **1** **U**
- (ii) Derive the mathematical expression for steady state stability of equilibrium point. **(8)** **1** **U**
- (OR)**
- (b) (i) Discuss the different modes of operation of an electrical drive. **(8)** **1** **U**
- (ii) Half hour rating of a motor is 100 KW. Heating time constant is 80 min and the maximum efficiency occurs at 70 % of full load. Determine the continuous rating of the motor. **(8)** **1** **AP**

12. (a) Describe a speed control scheme for a separately excited DC motor using a single phase half controlled thyristor bridge converter. (16) 2 U

(OR)

- (b) (i) Explain the operation of 4 quadrant chopper fed dc drives (8) 2 U
(ii) A 220V, 20A, 1000 rpm separately excited dc motor has an armature resistance of 2.5Ω . The motor is controlled by a step down chopper with a frequency of 1 KHz. The input dc voltage to the chopper is 250V. What will be the duty cycle of the chopper for the motor to operate at a speed of 600 rpm delivering the rated torque? (8) 2 AP
13. (a) With a block diagram, discuss the operation of a closed loop scheme for speed control of a dc motor below and above the base speed. (16) 3 U

(OR)

- (b) Discuss the current controller design using (i) P controller and (ii) PI controller for a separately excited dc motor drive system. (16) 3 AP
14. (a) Explain V/f control of induction motor drives using VSI. (16) 4 U

(OR)

- (b) (i) Describe using a circuit, the self-controlled mode of operation of a synchronous motor. (8) 4 U
(ii) Explain PF control of synchronous motor drives with a block diagram. (8) 4 U
15. (a) (i) Sketch the typical speed time curve for Main line service and to sub-urban services in electric traction. Find the equation for distance travelled for main line system. (10) 5 U
(ii) A sub-urban electric train has a maximum speed of 65 kmph. The schedule speed including a station stop of 30 seconds is 43.5 kmph. If the acceleration is 1.3 kmphs. Find the value of retardation when the distance between stops is 3 km. (6) 5 AP

(OR)

- (b) What are the various types of electric braking used in traction? Discuss in detail for DC shunt and series motors. (16) 5 U