

Total No. of Questions : 8]

[Total No. of Printed Pages : 2

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## EE/EX-7002-CBGS

### B.E. VII Semester

Examination, June 2020

## Choice Based Grading System (CBGS)

### Electric Drives

*Time : Three Hours*

*Maximum Marks : 70*

**Note:** i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Explain the operation of a single phase semi-controlled converter fed separately excited D.C motor drive.  
b) A 230V, 750rpm 25A dc series motor is driving at rated condition a load whose torque is proportional to speed squared. The combined resistance of armature and field is  $1\Omega$  calculate the motor terminal voltage and current for a speed of 400rpm. State the assumption made for solving this problem.
2. a) Derive an expression for the average output voltage of a  $3\phi$  semiconverter.  
b) The speed of a separately excited dc motor is controlled by means of a  $3\phi$  semi converter from a  $3\phi$  415V, 50Hz supply the motor constant are inductance 10mH resistance  $0.9\Omega$  and armature constant 1.5V/rad/sec (Nm/A). Calculate the speed of this motor at a torque of 50Nm when the converter is fired at  $40^\circ$ . Neglect losses converter.

EE/EX-7002-CBGS

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[2]

3. Explain with circuit diagram how regenerative braking is applied to
  - a) Separately excited dc motor and
  - b) Series dc motor
4. a) Explain multi-quadrant operation of a separately excited DC motor drive fed from a dual converter in detail.  
b) A 220V, 1500rpm, 50A separately excited DC motor with armature resistance of  $0.5 \Omega$  is fed from a circulating current dual converter with  $\phi_{ac}$  source voltage of 165V (line). Determine converter firing angles for the following operating points.
  - i) Motoring operation at rated motor torque and 1000 rpm.
  - ii) Braking operation at rated motor torque and  $-1000$  rpm.
5. a) Compare the operation of VSI and CSI fed Induction motor drive.  
b) Discuss variable frequency control of IM drive. Draw the relevant speed torque characteristics and derive the mathematical expression showing the relationship of max torque and operating frequency.
6. a) Explain the principles of operation of VSI fed induction motor.  
b) Show that a variable frequency induction motor drive develops at all frequencies the same torque for a given slip-speed when operating at constant flux.
7. a) How do you explain the operation of an induction motor speed control using rotor resistance variation?  
b) Explain the operation of an induction motor speed control using a chopper control.
8. a) Explain the conventional Scherbius system with that of a solid state Scherbius drive.  
b) Write short note:  
Separate and set control of synchronous motor.

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