

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2171707

Date: 02/11/2017

Subject Name: Industrial Drives and Control

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1**
- | | |
|---|-----------|
| (a) List out different selection criteria for the electrical drive. | 03 |
| (b) Obtain the state space model of the DC machine. | 04 |
| (c) Explain methods to measure the different DC machine constants. | 07 |

- Q.2**
- | | |
|--|-----------|
| (a) Explain shunt motor with its torque-speed characteristics. | 03 |
| (b) A series operated DC machine has 1.5 HP, 220V, 1600 rpm, armature resistance of 3Ω , field resistance of 1Ω , frictional coefficient of 0.002 Nm/(rad/sec) and mutual inductance of 0.0675H. Find (i) air gap torque (ii) armature current (iii) armature voltage. | 04 |
| (c) The separately excited DC machine has rating of 1200 KW, 500V, 2200 A, 400 rpm with brush drop of 3V, field power 35KW and armature resistance of 0.003Ω . It has variable armature voltage and fixed field current. Derive (i) Frictional torque with frictional coefficient 10 Nm/(rad/sec) (ii) Back EMF constant (iii) Input power (iv) Efficiency. | 07 |

OR

- | | |
|---|-----------|
| (c) Draw and explain equivalent circuit of DC machine. Derive the equation of electromagnetic torque. | 07 |
|---|-----------|
- Q.3**
- | | |
|--|-----------|
| (a) Draw the waveforms of 1st quadrant chopper operation for DC motor drive. | 03 |
| (b) Explain closed-loop speed control using DC drives. | 04 |
| (c) Explain the half-wave controlled rectifier based drives of DC motor with necessary waveforms and derive output voltage equation. | 07 |

OR

- Q.3**
- | | |
|--|-----------|
| (a) Explain principle of operation of the chopper. | 03 |
| (b) Draw the waveforms of 3rd quadrant chopper operation for DC motor drive. | 04 |
| (c) Explain with waveforms fully controlled rectifier based DC motor drive. | 07 |
- Q.4**
- | | |
|--|-----------|
| (a) Explain multi-pulse modulation technique for the induction motor. | 03 |
| (b) Give properties of PWM waveforms. Explain PWM inverters. | 04 |
| (c) Explain PWM and HCC hysteresis chopper based closed operation of DC motor drive. | 07 |

OR

- Q.4**
- | | |
|--|-----------|
| (a) Explain constant volts/Hz control for induction motor. | 03 |
| (b) Explain different input way to the chopper. | 04 |
| (c) Explain the operation of half-bridge modified McMurray inverter. | 07 |
- Q.5**
- | | |
|--|-----------|
| (a) Draw and explain torque versus stepping rate characteristic of stepper motors. | 03 |
| (b) Explain construction and working of VR stepper motors. | 04 |
| (c) Explain brushless DC motor. | 07 |



- Q.5** (a) List out important features of the stepper motors.
(b) Explain DC servo control.
(c) Explain drive circuits for the stepper motors.

03

04

07

firstRanker.com
www.FirstRanker.com