

Government College of Engineering, Aurangabad
(An Autonomous Institute of Government of Maharashtra)

M. E. (ELECTRICAL MACHINES & DRIVES) FT REVISED Examination
End Semester Examination November/December 2016

EE 644 – CONTROL OF ELECTRICAL DRIVES I

Time: Three Hours

1 5 DEC 2016

Max. Marks:60

“Verify the course code and check whether you got the correct question paper”

N. B.

1. Solve any four questions

2. Each question carry 15 Marks and sub-question carries (9+6) Marks

2. Assume suitable data if necessary and state it clearly

3. Use of non-programmable calculator is allowed

- Q.1. a) What are equivalent values of drive parameters? Draw block diagrams and Discuss in detail. (9M)
b) A weight of 500 kg is being lifted up at a uniform speed of 1.5 M/S by a winch driven by a motor running at a speed of 1000 rpm. The moment of inertia of the motor and the winch are 0.5 and 0.3 kg-m² respectively. Calculate the motor torque and the equivalent moment of inertia referred to the motor shaft. In the absence of weight, motor develops a torque of 100 N-m when running at 1000 rpm. (6M)
- Q.2. a) What is the importance of DC motor constants? Discuss different test methods to measure them. (9M)
b) A separately excited dc motor is delivering rated torque at rated speed. Find the efficiency of the motor at this operating point. The details of the machine are as follows: 1500 kW, 600 V, rated current = 2650 A, 600 rpm, Brush voltage drop = 2 V, Field power input = 50 kW, $R_a = 0.003645 \Omega$, $L_a = 0.1$ mH, Machine frictional torque coefficient = 15 N-m/(rad/sec). Field current is constant and the armature voltage is variable. (6M)
- Q.3. a) Discuss steady state analysis of the three phase converter controlled DC motor drive. (9M)
b) Discuss converter selection and characteristics of DC motor drive. (6M)
- Q.4. a) Discuss closed loop operation of chopper controlled DC motor drives with relevant block diagram and waveforms. (9M)
b) A dc motor is driven from a chopper with a source voltage of 24 V dc and at a frequency of 1 kHz. Determine the variation in duty cycle required to have a speed variation of 0 to 1 p.u. delivering a constant 2 p.u. load. The motor details are as follows:
1 hp, 10 V, 2500 rpm, 78.5% efficiency, $R_a = 0.01 \Omega$, $L_a = 0.002$ H, $K_b = 0.03819$ V/rad/sec. The chopper is one quadrant and the on state drop across the device is assumed to be 1 V regardless of the current variation. (6M)
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- b) Discuss ratings of the devices in chopper controlled DC motor drive. (6M)

P.T.O

- Q.5. a) Discuss in detail steady state performance equations of induction motor. Also draw flowchart for the computation of it. (9M)
- b) Describe Static Scherbius Drive scheme for slip energy recovery of an induction motor. (6M)
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