

**Government College of Engineering, Amravati**  
**(An Autonomous Institute of Government of Maharashtra)**

**Third Semester B. Tech. (Mechanical Engineering)**

**Winter – 2017**

**Course Code: EEU311**

**Course Name: Electrical Drives and Control**

**Time: 2 Hrs. 30 Min.**

**Max. Marks: 60**

**Instructions to Candidate**

- 1) All questions are compulsory.
- 2) Assume suitable data wherever necessary and clearly state the assumptions made.
- 3) Diagrams/sketches should be given wherever necessary.
- 4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
- 5) Figures to the right indicate full marks.

**1. Attempt any two**

- a) Illustrate N-channel enhancement operation of power MOSFET. 6
  - b) Distinguish between multi-motor drives and group drives. 6
  - c) At full load of a 10 HP, temperature rise of a motor is  $30^{\circ}\text{C}$  after one hour and  $40^{\circ}\text{C}$  after two hours. Determine :
    - 1] Continuous temp. rise on full load ;
    - 2] Heating time constant of motor;6
2. a) Obtain the useful torque equation of DC motor 6

*Contd..*

- b) Discuss the braking method of DC motor in which counter EMF is greater than supply voltage. 6

3. Attempt any two

- a) A 230 V dc shunt motor having an armature resistance of  $0.50 \Omega$  carries an armature current of 55 A and runs at 800 rpm. If the flux is reduced by 20%, Calculate the speed. Assume that load torque remains the same. 6
- b) A 500 V, 6 pole, 50 Hz, 3-phase induction motor develops 20 KW inclusive of mechanical losses when running at 995 rpm, the power factor being 0.87. Calculate i) the slip, ii) the rotor copper loss, iii) the total input if stator loss is 1500 W , iv) the line current and v) the rotor current frequency. 6
- c) Discuss in brief about the plugging of 3-phase induction motor. 6

4. Attempt any two

- $\frac{N_1}{N_2} = \frac{E_1}{E_2} + \frac{\phi_2}{\phi_1}$
- a) Explain speed control of 3-phase induction using rotor resistance method. 6
- b) Discuss the principle and working of BLDC motor. 6
- c) State and explain in brief classes of duty in electrical drive. 6
5. a) Give explanation for the selection of electrical drive for electrical traction. 6
- b) Discuss the working of electric drive for textile mill. 6

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- 4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
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**1. Attempt any two**

- a) Explain theory and working principle of power transistors. 6
  - b) Differentiate between DC drives and AC drives. 6
  - c) A motor operates on a periodic duty cycle 6 consisting of a loaded period of 20 min and a no load period of 10 min. The maximum temperature rise is  $60^{\circ}\text{C}$ . Heating and cooling time constants are 50 and 70 min respectively. When operating continuously on no load the temperature rise is  $10^{\circ}\text{C}$ . Determine:
    - 1] Minimum temp. during the duty cycle;
    - 2] Temp. when the motor is loaded continuously;
- 
2. a) Explain the speed control of DC shunt motor with aid of armature voltage and field current control method 6

- short notes*
- b) Explain dynamic braking of DC motor. 6
3. Attempt any two
- a) A 120V dc shunt motor having an armature circuit resistance of  $0.2 \Omega$  and field circuit resistance of  $60 \Omega$ , draws a line current of 40 A at full load. The brush voltage drop is 3 V. and rated full load speed is 1800 rpm. Calculate the speed at half load and the speed at 125% full load. 6
- b) The power input to the rotor of 440 V, 50 Hz, 6-pole, 3-phase induction motor is 80 kW. The rotor emf is observed to make 100 complete alternations per min. Calculate the rotor frequency, the slip, the rotor speed, the mechanical power developed, the rotor copper loss per phase and the rotor resistance per phase if the rotor current is 65 A. 6
- c) Explain the theory of working of star-delta starting of 3 phase induction motor. 6
4. Attempt any two
- a) Explain thyristorised stator voltage control of 3 phase induction motor. 6
- b) Discuss the principle and working of universal motor. 6
- e) Explain the steel mill. 6
5. a) Explain the variable reluctance stepper motor. 6  
b) Explain the working of electric drive for cement mill. 6

**Government College of Engineering, Amravati**  
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**III Semester B. Tech. (Mechanical Engineering)**

**Winter - 2015**

**Course Code: EEU 311**

**Course Name: Electrical Drives and Control**

**Time: 2 hr.30min.**

**Max. Marks: 60**

**Instructions to Candidate**

- 1) All questions are compulsory.
- 2) Assume suitable data wherever necessary and clearly state the assumptions made.
- 3) Diagrams/sketches should be given wherever necessary.
- 4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
- 5) Each sub-question (a,b,c) carries equal (6) marks.

1. (a) Explain the various types of industrial mechanical loads, which electrical motor need to drive.

(b) Define the terms Holding Current and Latching Current of the SCR. State various methods to turn-on and turn-off the SCR.

2. Attempt any TWO.

(a) Derive the expression for torque in a d c motor. What is the difference between gross torque and net torque ?

(b) Draw and explain the heating and cooling curves

Cont.

for a continuously rated electrical motor.

- (c) The armature resistance of a 500 V d c shunt motor is 1.2 ohm and it draws an armature current of 160 A at 800 rpm. If the main flux is reduced by 20 percent, what will be the new speed ? Assume that the torque remains constant.

3. Attempt any TWO.

- (a) Draw and explain the torque-slip characteristics of three-phase induction motor, for positive and negative values of slip.
- (b) State the various types of starters employed for three-phase induction motor. Explain the working of any one of them.
- (c) A three-phase, 6 pole, 50 Hz induction motor runs on full-load with a slip of 5 percent. If the rotor standstill impedance is  $(0.015+j0.075)$  ohm, calculate the available maximum torque in terms of full-load torque. Also determine the speed at which the maximum torque occurs.

4. Attempt any TWO.

- (a) Explain the armature control of d c motor using d c chopper.
- (b) Explain the construction and working principle of universal motor.
- (c) Why single-phase induction motor is not a self starting machine ? What is done to make it self start ?

5. (a) What are the various factors which decides selection of electrical drive for a particular application.
- (b) Explain the various processes involved and the drives employed in a paper mill.

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# Government College of Engineering, Amravati

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## Third Semester B. Tech. (Mechanical Engineering)

Winter – 2013

Course Code: EEU311

Course Name: Electrical Drives and Control

Time: 2 Hr. 30Min.

Max. Marks: 60

### Instructions to Candidate

- 1) All questions are compulsory.
  - 2) Assume suitable data wherever necessary and clearly state the assumptions made.
  - 3) Diagrams/sketches should be given wherever necessary.
  - 4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
  - 5) Each sub-question (a,b,c) carries equal (6) marks.
1. (a) Draw block diagram and explain the various components of Electrical Drive System.
- (b) State various methods to turn-on the SCR and explain any one of them.
2. Attempt any TWO
- (a) Draw and explain speed-torque characteristics of  
i) separately excited d c motor  
ii) d c series motor
- (b) Differentiate between plugging and rheostatic braking applied to d c shunt motor.
- Date 6/3/19  
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- (c) A 220 V, 500 A, 600 rpm separately excited d c motor has armature and field resistances of 0.02 and 10 ohms respectively. The load torque is given by the expression  $T_L = 2000 - 2N$ , where N is the speed in rpm. Calculate motor terminal voltage and armature current when the speed is 450 rpm.

3      **Attempt any TWO**

- (a) Draw the torque-speed characteristics of three-phase induction motor for various values of :  
i) stator voltage ii) stator frequency  
iii) rotor resistance.
- (b) Explain with circuit diagram, the plugging operation of a three-phase induction motor.
- (c) A three-phase, 6 pole, 50 Hz induction motor runs on full-load with a slip of 5 percent. If the rotor standstill impedance is  $(0.015+j0.075)$  ohm, calculate the available maximum torque in terms of full-load torque. Also determine the speed at which the maximum torque occurs.

4.      **Attempt any TWO**

- (a) Explain the speed control of d c motor using single-phase thyristorised converter. (phase control)
- (b) Explain the construction and working principle of a linear induction motor.
- (c) Why single-phase induction motor is not a self starting machine ? What is done to make it self start ?

5. (a) What do you mean by 'duty' of an electrical motor? State the various classes of duty for an electrical motor and explain any one of them.
- (b) Explain the various processes involved and the drives employed in a steel mill.