

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EE311

Course Name: ELECTRICAL DRIVES & CONTROL FOR AUTOMATION

Graph sheet to be provided

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks.

Marks

- 1 a) With a sketch explain the working principle of a generator (4)
 b) What is the basic difference between self and separately excited generators (4)
 c) A 6 pole lap wound dc generator has 1200 conductors on its armatures. The flux/pole is 10 milli weber. Calculate the speed at which generator should be driven to generate 250 volts. (2)
- 2 a) The magnetization curve of a dc shunt generator at 1500 rpm is (8)
- | | | | | | | | | | |
|----------|---|-----|-----|-------|-------|-----|-----|-----|-----|
| $I_f(A)$ | 0 | 0.4 | 0.8 | 1.2 | 1.6 | 2.0 | 2.4 | 2.8 | 3.0 |
| $E_o(V)$ | 6 | 60 | 120 | 172.5 | 202.5 | 221 | 231 | 237 | 240 |
- For this generator find
- i) No load emf for a total shunt field resistance of 100Ω .
 ii) Critical field resistance at 1500 rpm
 iii) The magnetization curve at 1200 rpm and therefore from the open circuit voltage for a field resistance of 100 ohm
- b) Define critical resistance of a dc machine (2)
- 3 a) List out the application of series, shunt and compound motors (4)
 b) Derive the speed-torque characteristics of a dc shunt and series motor (6)
- 4 a) A 220V shunt motor has armature and field resistance of 0.2Ω and 220Ω respectively. The motor is driving a constant load torque and running at 1000 rpm drawing 10A current from supply. Calculate the new speed and armature current if an external armature resistance of 5Ω is inserted in armature circuit. Neglect armature reaction and saturation (6)
 b) Derive the condition for maximum efficiency in a dc machine (4)

PART B

Answer any three full questions, each carries 10 marks.

- 5 a) Explain the working principle of a transformer under no load. Also draw the vector diagram at no load. (4)
 b) Define all day efficiency of a transformer (2)
 c) Derive the condition for maximum efficiency of a transformer (4)
- 6 a) Explain how the equivalent circuit parameters are obtained from transformer tests. Also draw the equivalent circuit. (6)

- b) The maximum flux density in the core of a 250/3000V, 50 Hz single transformer is 1.2 Wb/m^2 . If the emf/turn is 8V. Determine i) primary and secondary turns ii) Area of core (4)
- 7 a) List out the difference between slipring and squirrel cage induction motor (4)
b) Explain the torque- slip characteristics of three phase induction motor (4)
c) What is meant by slip of an Induction motor (2)
- 8 a) A 40kW 6 pole 3 phase induction motor delivers full load output of 950 rpm at 0.85 powerfactor when connected to a 500 V, 50 Hz supply. Friction and windage losses equals 1.5 kW and stator losses are 1.8 kW. Determine for this load i) Total rotor copper loss (8)
ii) Efficiency
iii) Line current
b) What is meant by circle diagram of a Induction motor (2)

PART C

Answer any four full questions, each carries 10 marks.

- 9 a) Explain the constructional details of single phase induction motor (4)
b) Explain any two methods of starting of single phase induction motors (4)
c) What is meant by regulation of an alternator? (2)
- 10 a) A 3 phase, 1500 KVA, star connected 50 Hz, 2300 V alternator has a resistance of 0.12Ω per phase. A field current of 70 A produces a short circuit current equal to full load current of 376 A in each line. The same field current produces an emf of 700V on open circuit. Determine the synchronous reactance of the machine and its full load regulation of 0.8 pf lag (6)
b) Explain the working principle of a synchronous motor. (4)
- 11 a) What is the purpose of synchronous condenser? (2)
b) Explain synchronous impedance of an alternator. How can it be determined? (4)
c) List any two advantages and two disadvantages of synchronous motors (4)
- 12 a) With neat diagram explain the working principle of linear stepper motors (8)
b) What is meant by stepping angle of variable reluctance motor? (2)
- 13 a) With the help of block diagram explain the different control of stepper motors (6)
b) Explain Servo control and Digital control used for automation (4)
- 14 a) What is machine tool controller? (4)
b) Explain the features and applications of PLC (6)
