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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree (S,FE) Examination January 2023 (2015 scheme)

Course Code: EE311

Course Name: ELECTRICAL DRIVES & CONTROL FOR AUTOMATION

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks. Marks

1 a) Explain the effect of demagnetization effect and cross magnetization effect on a dc machine with neat figures. (6)

b) A separately excited generator when running at 1000 rpm supplies 220 A at 120V to a circuit of constant resistance. If the field current remain unaltered what will be the load current when the speed drops to 800 rpm? Armature resistance 0.04Ω and total drop at brushes 2V. (4)

2 a) A 4 pole lap wound dc shunt generator has flux per pole of 0.05Wb. The armature winding consists of 200 turns, each turn having a resistance 0.004Ω. Calculate the terminal voltage when running at 1000 rpm if the armature current is 60A. (5)

b) Explain the steps involved in determining the critical speed and shunt field resistance of a generator with necessary figures. (5)

3 a) A dc shunt machine when run as a motor on no-load takes 440W and runs at 1000 r.p.m. The field current and armature resistance are 1A and 0.5Ω respectively. Calculate the efficiency of the machine when (i) running as a generator delivering 40A at 220V and (ii) as a motor taking 40A from a 220V supply. (8)

b) Explain the necessity of starters in motors. (2)

4 a) A 500V, 35 kW, 1000 rpm dc shunt motor has on full-load an efficiency of 88%. The armature circuit resistance is 0.24 ohm and there is a total voltage drop of 2V at the brushes. The field current is 2A. Determine (i) full load line current (ii) (4)

full load shaft torque (iii) total resistance in motor starter to limit the starting current to 1.5 times the full load current.

b) Compare the electrical characteristics of dc shunt motor and dc series motor. (6)

PART B

Answer any three full questions, each carries 10 marks.

5 a) With neat phasor diagram explain the operation of an ideal transformer. (3)

b) A single phase transformer has 1000 turns on the primary and 200 turns on the secondary. The no-load current is 3A at a pf of 0.2 lag. Calculate the primary current and power factor when the secondary current is 280A at a pf of 0.8 lag. (4)

c) Draw and the equivalent circuit of a transformer referred to its primary and comment on each component. (3)

6 a) List any 3 merits and demerits of autotransformer. (6)

b) Explain the losses in a transformer. (4)

7 a) With neat phasor diagrams explain how a rotating magnetic field is created in an induction machine. (8)

b) A 50 Hz, 4 pole, 3 phase induction motor has a rotor current of frequency 2 Hz. Determine (i) slip and (ii) speed of the motor. (2)

8 a) Compare squirrel cage and wound rotor induction motor based on rotor construction. (3)

b) Explain with figure, the torque slip characteristics of an Induction motor. (5)

c) Explain the significance of slip in a 3 phase Induction motor. (2)

PART C

Answer any four full questions, each carries 10 marks.

9 a) Explain double field revolving theory of single phase Induction motor with suitable diagrams. (8)

b) List any two characteristics of a capacitor start motor. (2)

10 a) At starting the windings of a 230V, 50Hz, split-phase Induction motor have resistance and inductive reactance of main winding as 4 ohm and 7.5 ohm respectively and resistance and inductive reactance of starting winding as 7.5 ohm and 4 ohm respectively. Find (i) the current I_m in the main winding and (5)

current I_s in the starting winding (ii) phase angle between I_s and I_m (iii) line current (iv) power factor of the motor.

b) With neat diagrams explain the operation of a split phase Induction motor. (5)

11 a) With neat phasor diagram explain the working of synchronous condenser. (3)

b) Derive the e.m.f equation of an alternator. (4)

c) What is V-curve for an alternator? Draw the changes in it while operating at different conditions. (3)

12 a) Compare Permanent Magnet Stepper motor and Variable Reluctance Stepper motor. (10)

13 a) With neat block diagram, explain Servomechanism. (5)

b) Explain Programmable Logic Controllers. (5)

14 a) Compare Hybrid Stepper motor and Linear Stepper motor. (6)

b) Explain Digital Controllers. (4)

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