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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: EE311

Course Name: ELECTRICAL DRIVES & CONTROL FOR AUTOMATION (AU, ME)

Max. Marks: 100 Duration: 3 Hours

PART A

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

1 a) Derive an expression for the e.m.f generated in a d.c machine. (4)

b) What is meant by armature reaction? How does it will affect the main field flux? (2)

c) List out the different methods of excitation. Explain. (4)

2 a) A d.c shunt generator operating at 850rpm is given below (8)

Eg(V): 12 40 102 176210 240 256

I_f(A): 0 0.5 1 2 345

The machine has 6 poles. The type of winding is lap. The number of conductors in the armature is 540.

i) Calculate residual flux per pole.

ii) The no load e.m.f for a total shunt field resistance of 120Ω.

iii) The critical field resistance of the field circuit.

iv) The critical speed for the shunt field resistance of 120Ω.

b) Define critical speed and critical field resistance of a d.c shunt generator. (2)

3 a) Derive an expression for the electromagnetic torque developed in a d.c motor. (2)

b) A d.c shunt motor runs at 1300rpm on no-load drawing 5A from 220V mains. Its armature and field resistance are 0.24Ω and 110Ω respectively. When loaded .the motor draws 60A from the mains. Calculate the speed when the motor is loaded. Assume that the armature reaction demagnetizes the field by 3%. Also calculate the internal torque developed at no load and on load. What is the motor shaft torque at load? (8)

4 a) Derive the speed-torque characteristics of a d.c shunt and d.c series motor. (4)

b) What are the losses occurring in a d.c motor and how do they vary with load current? (3)

c) Why a starter is required for starting a d.c motor? (3)

PART B

Answer any three full questions, each carries 10 marks.

5 a) Derive the e.m.f equation of a single phase transformer. (4)

b) Draw the phasor diagram of a 1-phase transformer at no load and derive the equivalent circuit. (4)

c) Explain the difference between an ideal transformer and an actual transformer (2)

6 a) What are the losses produced in a transformer and derive the condition for (4)

maximum efficiency.

b) A 40kVA single phase transformer has iron loss of 450W and full load copper loss of 850W. If the pf of the load is 0.8 calculate: (4)

i) The full load efficiency.

ii) The maximum efficiency.

iii) The load at which maximum efficiency occur.

c) Write short notes on instrument transformers. (2)

7 a) Explain the principle of operation of a 3-phase induction motor (4)

b) Differentiate between squirrel cage and slipring induction motor. (2)

c) Write short notes on torque-slip characteristics of a 3-phase induction motor (4)

8 a) Explain no load and blocked rotor test on a 3-phase induction motor and derive the equivalent circuit parameters. (4)

b) What is meant by circle diagram of a induction motor? What are the information that can be obtained from the circle diagram? (1)

c) Explain with the help of neat diagram the working of any two methods of starting a 3-phase induction motor. (5)

PART C

Answer any four full questions, each carries 10 marks.

9 a) Derive the e.m.f equation of an alternator. (3)

b) What is meant by regulation of an alternator? (1)

c) How can you determine the regulation of an alternator by e.m.f method? Explain. (6)

10 a) Explain the principle of operation of 1-phase induction motor. (2)

b) Explain the pitch factor and distribution factor of an alternator. (4)

c) What is a universal motor? What are the applications of this type of motors? (4)

11 a) Why synchronous motor has no net starting torque. (2)

b) Explain the methods of starting synchronous motor (6)

c) What is synchronous condenser? (2)

12 a) With a neat sketch, explain the working of a permanent magnet stepper motor. (7)

b) List out the classification of stepper motor and compare them. (3)

13 a) Draw and explain the torque-speed characteristics of stepper motor. (3)

b) Write short notes on servo control and digital controllers. (7)

14 a) What is machine tool controller? (3)

b) With neat diagram explain programmable logic controllers. (7)

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