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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Dec. - 2019

Electrical Machines - II

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. With relevant sketches, explain the phenomenon of armature reaction in a DC machines. 8

b. Explain the use of compensating winding in DC machines. 6

c. Explain the load characteristics of DC series generator. 6

2 a. With neat figure, explain the process of commutation in a coil undergoing short circuit. 8

b. An 8 pole wave wound DC generator has 480 armature conductors. The armature current is 200 A. Find the armature reaction demagnetizing and cross magnetizing ampere turns/pole if, 6

i) Brushes are on GNA ii) Brushes are shifted 6° electrical from GNA

c. Write an explanatory note on EMF commutation. 6

UNIT - II

3 a. Sketch and explain speed-current, speed-torque and torque-current characteristics of DC shunt-motor and DC series motors. 8

b. Mention the factors controlling the speed of a motor and explain flux control method for DC shunt motor. 6

c. A 120 V, DC shunt motor has an armature resistance of 0.2 Ω and a field resistance of 60 Ω. It runs at a1800 rpm taking a FL current of 40 A. Find the speed on half load condition. 6

4 a. What is back EMF? Explain the significance of back EMF. 4

b. What is the need of a starter in a DC machines? With a neat sketch, explain 3-point starter. 8

c. A 220 V shunt motor with an armature resistance of 0.5 Ω is excited to give constant main field. At FL the motor runs at 500 rpm and takes an armature current of 30 A. If a resistance of 1 Ω is placed in the armature circuit, find the speed at; 8

i) FL torque ii) Double FL torque iii) Stalling torque

UNIT - III

5 a. With a neat diagram, explain the procedure of conducting Swinburne's test on DC motor mention the advantages of this test. 10

b. With an neat sketch, explain the construction and principle of operation of, 10

i) Brush less DC motor

ii) Universal motor

Contd…2

6 a. With a neat circuit diagram, explain how efficiency can be determined for DC machines by Hopkinson's test? 10

b. A field's test on two mechanically coupled similar motors with their field connected in series and with one machine running as a motor and the other as a generator gave the following data. 10

Motor: Armature current 40 A, Armature voltage 200 V, the drop across its field winding 15 V

Generator: Armature current 32 A, Armature voltage 160 V, the drop across its field winding 15 V

The resistance of each armature is 0.4 Ω. Calculate the efficiency of each machine at this load.

UNIT - IV

7 a. With a neat sketch, distinguish between salient and non-salient pole synchronous generator. 6

b. Explain the methods of reducing harmonics in synchronous generator. 6

c. A 1200 kVA, 6600 V, 3 phase star connected alternator has its armature resistance as 0.25 Ω per phase and its synchronous reactance as 5 Ω per phase. Calculate its regulation if it delivers a FL at, 8

i) 0.8 lagging pF

ii) 0.8 leading pF

8 a. Define voltage regulation. Explain ZPF method of determining the voltage regulation of an alternator with necessary curves. 10

b. A 600 V, 60 kVA, 1ϕ alternator has an armature (effective) resistance of 0.2 Ω. A field current of 10 A produces an armature current of 210 A on short circuit and an emf of 480 V on open circuit. Calculate; 10

i) Synchronous impedance and reactance

ii) Regulation at 0.8 pF lagging and 0.6 pF leading

UNIT - V

9 a. Explain the method of synchronising a 3-phase synchronising machine to the infinite busbars by dark lamp method. 10

b. With a neat diagram, explain the slip test on salient pole synchronous machine and indicate how X_d and X_q can be detemined from the test? 10

10 a. With the help of phasor diagram, discuss the behavior of synchronous motor with the constant load and variable excitation. 10

b. Write an explanatory note on; 10

i) V and inverted V curves

ii) Hunting in synchronous machine

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