Code: 15A02504 **R15**

B.Tech III Year I Semester (R15) Regular Examinations November/December 2017

ELECTRICAL MACHINES – III

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Write the types of rotors used in synchronous generators. Where are they used?

(b) What is the purpose of skewing?

(c) Write an expression for % voltage regulation. Name the methods for finding voltage regulation an alternator.

(d) Name the tests to be conducted for zero power factor method.

(e) Give the expressions for calculation of synchronizing power and synchronizing torque.

(f) When two alternators are operating in parallel, what are the effects of instantaneous reduction in the angular velocity of one machine?

(g) What is hunting of synchronous motors?

(h) Draw the vector diagram of synchronous motor for no-load condition with losses.

(i) Name the basic types of single phase induction motors which start on the split phase principle.

(j) What are universal motors?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Derive the emf equation of an alternator.

(b) A $3-\phi$, 10 pole alternator has 2 slots per pole per phase on its stator with 10 conductors per slot. The air gap flux is sinusoidelly distributed and equals to 0.05 Wb. The stator has double layer winding with a coil span of 150° electrical. If the alternator is running at 600 rpm, calculate the emf generated per phase at no load.

OR

3 Explain in detail the reasons for variation in terminal voltage of an alternator on load.

UNIT – II

4 (a) Why synchronous impedance method is called pessimistic method?

(b) A $3-\phi$, star connected alternator is rated at 1500 kVA, 12000 V. The armature effective resistance and synchronous reactance are 2 Ω and 35 Ω respectively per phase. Calculate the % regulation for a load of 1200 kW at (i) 0.8 lagging pf (ii) 0.8 leading pf.

OR

5 (a) Define Xd and Xq.

(b) A 2200 V, 50 Hz, $3-\phi$, star connected alternator has an effective resistance of 0.5 Ω per phase. A field current of 30 A produced the full-load current of 200 A on short circuit and a line-to-line emf of 1100 V on open circuit. Determine the power angle of the alternator when it delivers full load at 0.8 lagging per factor.

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UNIT – III

6 A 2-pole, 50 Hz, $3-\phi$, turbo alternator is excited to generate the bus-bar voltage of 11 kV on no-load. The machine is star connected and the short circuit current for this excitation is 1000 A. Calculate the synchronizing power per degree of mechanical displacement of the rotor and the corresponding synchronizing torque.

OR

7 Two alternators working in parallel supply a lighting load of 3000 kW and a motor load aggregating to 5000 kW at a p.f 0.72. One machine is loaded up to 5000 kW at 0.8 p.f lagging. What is the load and power factor of the other machine?

UNIT – IV

8 (a) What are synchronous condensers? Explain.

(b) A 440 V, 50 Hz, $3-\phi$ circuit takes 18 A at a lagging power factor of 0.8 A synchronous motor is used to raise the power factor to unity. Calculate the kVA input to the motor and its power factor when driving a mechanical load of 6 kW. The motor has an efficiency of 88%.

OR

9 What is the necessity of a starting method of synchronous motor? Explain different methods of starting of synchronous motors.

UNIT – V

10 Describe the construction and working of single phase induction motor. Give their applications and disadvantages.

OR

11 Explain the construction and principle of operation of shaded – pole induction motor with neat diagrams.

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