

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019

Subject Code: 2140906

Date: 12/12/2019

Subject Name: AC Machines

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) Explain working principle of Induction motor.	03
	(b) Explain production of rotating magnetic field in poly-phase induction motor.	04
	(c) Why single phase induction motors are not self-started? Explain double field revolving theory for single phase induction motor.	07
Q.2	(a) What is Synchronous condenser?	03
	(b) Explain with reason why synchronous motor is not self-starting. Enumerate different methods of starting the synchronous motor.	04
	(c) Explain the working principle of Induction Generator. Also discuss the applications of Induction generator.	07
	OR	
	(c) Draw and explain speed – torque characteristic of an Induction motor.	07
Q.3	(a) Why starter needed for poly phase induction motor?	03
	(b) Write a note: Shaded pole motor and Universal motor.	04
	(c) Explain the procedure to construct the circle diagram of induction motor. Also describe the method to determine losses, efficiency and slip at full load condition using circle diagram.	07
	OR	
Q.3	(a) Discuss working of Repulsion motor.	03
	(b) Write a note on: (i) Crawling (ii) Cogging of induction motor.	04
	(c) Rotor resistance and standstill reactance per phase of a 3-phase, 746 kW, 50 Hz, 16-pole induction motor are 0.02 Ω and 0.15 Ω respectively. Full load torque is obtained at 360 rpm. Calculate: (i) the ratio of maximum to full-load torque (ii) The speed at maximum torque (iii) What should be the external resistance required at start in rotor circuit to obtain maximum torque at start.	07
Q.4	(a) Derive the emf equation of an alternator.	03
	(b) Define the pitch factor and distribution factor for synchronous generator.	04
	(c) A 3-phase water wheel generator is rated at 100 MVA, 0.9 power factor, 11 kV, star-connected, 50 Hz, 120 rpm. Determine	07
	(i) The number of poles	
	(ii) The kW rating	
	(iii) The current rating of the alternator	
	(iv) The input at rated kW if the efficiency is 97% (ignore field losses)	
	(v) Input torque (prime-mover torque)	
	OR	
Q.4	(a) Explain various conditions for synchronization of the alternator.	03

- (b) Describe the effect of armature reaction in case of a synchronous generator. **04**
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- (c) Explain determination of voltage regulation by ZPF method. **07**
- Q.5** (a) Write a note on double cage induction motor. **03**
(b) Derive the equation of electromagnetic torque for a three phase induction motor with usual notations from first principles. **04**
(c) Explain concept of linear induction motor. Also give relative advantage and disadvantage. **07**
- OR**
- Q.5** (a) How direct axis and quadrature axis reactance can be measured for salient pole machine? **03**
(b) Write a note on Schrage motor. **04**
(c) Explain V-curves in brief. Also give its importance for synchronous motors. **07**

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