

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2021

Subject Code:2140906

Date:06/09/2021

Subject Name:AC Machines

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1**
- | | | |
|-----|---|-----------|
| (a) | Define pitch factor and distribution factor of an alternator. | 03 |
| (b) | Derive the EMF equation of an alternator. | 04 |
| (c) | Discuss the conditions to be satisfied for proper synchronization of two alternators. | 07 |

- Q.2**
- | | | |
|-----|--|-----------|
| (a) | Draw the schematic diagram and explain the principle of induction generator. | 03 |
| (b) | Explain torque-slip characteristics of an induction motor. | 04 |
| (c) | Describe the effect of armature reaction in case of a synchronous generator. | 07 |

OR

- | | | |
|------------|--|-----------|
| (c) | Mention the types of starters for a three phase induction motor. Explain any one in detail. | 07 |
| Q.3 | (a) Define voltage regulation of an alternator and list the methods of determination of voltage regulation of an alternator. | 03 |
| | (b) Explain with reason why synchronous motor is not self starting. | 04 |
| | (c) In a 50-KVA, star connected, 440-V, 3-phase, 50Hz alternator, the effective armature resistance is 0.25 ohm per phase. The synchronous reactance is 3.2 ohm per phase and leakage reactance is 0.5 ohm per phase. Determine at rated load and unity power factor: (a) Internal e.m.f. E_a (b) no-load e.m.f. E_o (c) percentage regulation on full-load (d) value of synchronous reactance which replaces armature reaction. | 07 |

OR

- Q.3**
- | | | |
|-----|--|-----------|
| (a) | Derive the maximum starting torque condition for three phase induction motor. | 03 |
| (b) | The power input to the rotor of a 400V,50Hz, 6-pole , 3-phase induction motor is 20KW. The slip is 3%. Calculate (a) the frequency of rotor currents (b) rotor speed (c) rotor copper losses and (d) rotor resistance per phase if rotor current is 60A. | 04 |
| (c) | Explain the construction and working of universal motor. | 07 |
- Q.4**
- | | | |
|-----|--|-----------|
| (a) | Briefly explain the role of capacitor in the ceiling fan. | 03 |
| (b) | Briefly explain the double field revolving theory in relation to single phase AC motors. | 04 |
| (c) | Draw the schematic diagram and explain the construction and working of shaded pole single phase motor. | 07 |

OR

- Q.4** (a) What do you mean by auto synchronous motor? **03**
(b) Briefly explain V-curves of synchronous 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**

- Q.5** (a) Find the percentage tapping on an auto-transformer required for a squirrel cage motor to start the motor against $\frac{1}{4}$ of full-load torque. The short-circuit current on normal voltage is 4 times the full-load current and the full-load slip is 3%. **03**
(b) Explain different torques of a synchronous Motor. **04**
(c) List out the methods of speed control of Induction Motor. Explain any one in detail. **07**

OR

- Q.5** (a) A 3-phase, 16-pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03Wb, Sinusoidally distributed and the speed is 375 r.p.m. Find the frequency in Hz, the phase and line e.m.f. Assume full-pitched coil. **03**
(b) Explain the applications of a synchronous Motor. **04**
(c) Explain construction and working principle of Schrage Motor. **07**
