

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: BE
BRANCH: EEE**

**SEMESTER : V
SESSION : MO/19**

SUBJECT: EE5203 ELECTRICAL MACHINE II

TIME: 3 HOURS

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
 2. Candidates may attempt any 5 questions maximum of 60 marks.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) What do you mean by integral slot winding and fractional pitch winding? [2]
- Q.1(b) By means of diagram, describe the main parts of alternator with their function. [4]
- Q.1(c) A 3 phase, 16 poles synchronous generator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03wb and speed is 375 rpm. Calculate the line frequency and the induced emf per phase. [6]
- Q.2(a) Explain the term synchronous reactance. [2]
- Q.2(b) A 50 kVA, 500V, single phase alternator gave the following results in open and short circuit tests: [4]
- | | | | | | | |
|-----------------------|-----|-----|-----|-----|-----|-----|
| Field Current(A): | 5 | 10 | 15 | 20 | 25 | 30 |
| EMF(volts): | 125 | 250 | 370 | 480 | 566 | 640 |
| S.C. Arm. current(A): | 73 | 146 | 220 | | | |
- Using ampere turn method, find the full load voltage regulation at unity power factor and 0.8 leading power factor.
- Q.2(C) Explain the phenomena armature reaction when alternator is delivering a load at unity pf and lagging pf. [6]
- Q.3(a) In what respect is the operation of alternator on infinite bus different from parallel operation of two alternators. [2]
- Q.3(b) State the condition necessary for paralleling alternator and describe one method of synchronizing. [4]
- Q.3(c) A 3 phase star connected synchronous generator supplies a current of 10 amp having phase angle of 20 degree lagging at 400 volts(phase voltage). Find [6]
- (a) the load angle (b) I_d and I_q of armature current
(c) Voltage regulation, when X_d is 10 ohm, X_q is 6.5 ohm. Neglect armature resistance.
- Q.4(a) A 3-phase synchronous motor has 12 poles and operates from 440 volts, 50 Hz supply. Calculate its speed, if it takes a line current of 100A at 0.8 pf lead. What torque the motor will be developing? Neglect losses. [2]
- Q.4(b) Why is synchronous motor not self-starting? What method is generally used to start the synchronous motor? [4]
- Q.4(c) Explain V- Curve, Inverted V- Curve and synchronous condenser for synchronous motor. [6]
- Q.5(a) Draw and explain the phasor diagram of a 3 phase induction motor. [2]
- Q.5(b) Derive the equation for torque developed by an induction motor and explain torque slip curve. [4]
- Q.5(C) The power input to a 6 pole, 3 phase, 50 Hz induction motor is 42 kw, the speed is 970 rpm. The stator losses are 1.2 kw and the frictional and windage losses are 1.8 kw. Find slip, rotor copper losses, bhp and efficiency. [6]
- Q.6(a) Explain cogging and crawling phenomena of 3-phase induction motor. [6]
- Q.6(b) Discuss auto transformer and star delta starter for starting of 3-phase induction motor. [6]
- Q.7(a) Explain the operation of single phase induction motor by double field revolving theory. [2]
- Q.7(b) Discuss the operation, characteristics and application of capacitor start induction motor. [4]
- Q.7(c) A 0.5 hp, 230 V, single phase induction motor (split phase) takes a current of 4.2A lagging the voltage by 10 degree for starting winding and a current of 6.2A lagging the voltage by 40 degree for its main winding. Find [6]
- (a) total current and pf at starting and during running, (b) phase angle between I_s and I_m
(c) power drawn by starting and running winding, and (d) total power drawn.