

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

**CLASS: BE
BRANCH: EEE**

**SEMESTER: V
SESSION : MO/2018**

SUBJECT : EE5203 ELECTRICAL MACHINES - II

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

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- Q1 (a) Elucidate Rotating Magnetic Field? Derive expression for it from fundamental. [2]
(b) A 3-phase star connected, 10-pole alternator has 90 slots, each containing 12 conductors. [3]
If the speed is 600 r.p.m and the flux per pole is 0.1 Wb, calculate the line e.m.f when
the phases are star connected. Assume winding factor=0.96 and the flux is sinusoidally
distributed.
- Q2 (a) Mention conditions for the development of steady state electromagnetic torque in an [2]
alternator
(b) A 4-pole, 3-phase, 50-Hz, star-connected alternator has 60 slots, with 4 conductors per [3]
slot. Coils are short-pitched by 3 slots. If the phase spread is 60° , find the line voltage
induced for a flux per pole of 0.943 Wb distributed sinusoidally in space. All the turns per
phase are in series.
- Q3 (a) What is Armature Reaction? Explain for different types of loads? [2]
(b) A 3-phase, star connected alternator supplies a load of 10MW at p.f 0.85 lagging at 11 kV. [3]
Its resistance is 0.1 ohm per phase and synchronous reactance is 0.66 ohm per phase.
Calculate the line value of e.m.f generated.
- Q4 (a) Draw a neat circuit diagram for open circuit test of an alternator. [2]
(b) Determine voltage regulation of a 200-V, 1-phase alternator delivering a current of 100A [3]
at i) upf ii) 0.8 pf lagging
Test Results $V_{oc} = 500V$, $I_{sc} = 100 A$ for the same field excitation. Draw circuit and phasor
diagram.
- Q5 (a) Explain synchronous impedance and synchronous speed. [2]
(b) A 3-phase, 11kV, 5-MVA, Y-connected alternator has a synchronous impedance of $1+10j$ [3]
ohm per phase. Its excitation is such that the generated line e.m.f is 14kV. If the
alternator is connected to infinite bus bars, determine maximum output at the given
excitation.
- Q6 (a) Draw power angle characteristics of an alternator. [2]
(b) Explain synchronization and methods of synchronization. [3]

::: 10/09/2018 :::