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Sub Code: EEE501

Paper Id:2020

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B.TECH
(SEM V) THEORY EXAMINATION 2017-18
ELECTRO-MECHANICAL ENERGY CONVERSION – II

Time: 3 Hours**Total Marks: 100**

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.
 2. Any special paper specific instruction.

SECTION A

- 1. Attempt all questions in brief. 2 x 10 = 20**
- Derive e.m.f. equation of an alternator.
 - Define pitch factor and distribution factor of an alternator.
 - Explain necessary condition of synchronization of a synchronous machine.
 - Explain why synchronous motor is not self starting.
 - Why induction motor cannot run at synchronous speed?
 - Draw and explain torque slip characteristic of induction motor.
 - Why starter is necessary for the starting of induction motor?
 - What is the effect of harmonics on the performance of induction motor?
 - Write a short note on repulsion motor.
 - Describe working of universal motor.

SECTION B

- 2. Attempt any three of the following: 10 x 3 = 30**
- Explain clearly the ZPF method of determining the regulation of alternator.
 - The excitation of 415 V, 3 phase, mesh connected synchronous motor is such that the induced e.m.f. is 520 V. The impedance /phase is $0.5+j4 \Omega$. If the friction and iron loss are constant and equal to 1000 watts. Calculate HP output, line current, power factor and the efficiency for maximum power output.
 - Derive the relation for torque developed in 3 phase induction motor, also derive the condition for maximum torque.
 - What is e.m.f. injection method for the speed control of 3 phase induction motor? Explain in detail.
 - Explain construction working and application of variable reluctance and permanent magnet stepper motor.

SECTION C

- 3. Attempt any two part of the following: 5 x 2 = 10**
- What is armature reaction? Explain the effect of load power factor on armature reaction.
 - A 230v , 3 phase ,star connected alternator gives an open circuit e.m.f. of 230v , for a field current of 0.38 A. The same field current on short circuit cause an alternator current of 12.5 amp . The armature resistance measured between two lines is 1.8Ω . Find the regulation for the current of 10 A at 0.8 lagging and 0.8 leading power factors.
 - Derive the expression for synchronizing power and torque for 3 phase synchronous machine.

- 4. Attempt any two part of the following: 5 x 2 = 10**
- (a) Describe two reaction theory for a salient pole synchronous machine.
 - (b) Explain hunting and damping in synchronous motor.
 - (c) A synchronous motor is used to improve the power factor of a load of 750KW from 0.6 lagging to 0.9 lagging . the motor also carry a load of 50 KW . calculate:
 - (i) KVA rating of motor
 - (ii) Leading KVAR supplied by motor
 - (iii) Power factor of motor
- 5. Attempt any two part of the following: 5 x 2 = 10**
- (a) Explain block rotor test on a 3 phase induction motor also explain why this test is performed.
 - (b) Develop an equivalent circuit of an induction motor and explain in detail.
 - (c) A 3 phase,4 pole ,50Hz induction motor has star connected rotor. The voltage across each phase of the rotor at standstill 121V. The rotor resistance is 0.3Ω and standstill reactance is 0.8Ω per phase. If in the running condition rotor current per phase is 15 A, calculate the speed at which it is running.
- 6. Attempt any one part of the following: 10 x 1 = 10**
- (a) Explain the phenomenon of cogging and crawling in 3 phase induction motor.
 - (b) Describe in brief construction and working of deep bar and double cage induction motor.
- 7. Attempt any one part of the following: 10 x 1 = 10**
- (a) Explain construction and working of a single phase induction motor, also explains any two types of induction motor.
 - (b) (i) Draw and explain equivalent circuit of single phase induction motor without core loss.
(ii) Write a short note on single phase A.C. series motor.