

BTECH
(SEM 5) THEORY EXAMINATION 2018-19
ELECTRICAL MACHINES

Time: 3 Hours**Total Marks: 70****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 7 = 14**

- a) Since voltage is a form of potential energy, where does the energy represented by an induced voltage come from? Explain.
- b) What is commutation?
- c) Define reactance voltage.
- d) What are slot harmonics?
- e) What is breadth factor?
- f) Why does the power factor of industrial installation tend to be low?
- g) What is meant by slip of an induction motor?

SECTION B**2. Attempt any three of the following:****7 x 3 = 21**

- a) Derive an equation for dynamically induced emf. On what factors does this emf depend?
- b) Derive a relation between emf and torque in a DC machine. Is this relation valid for generator or motor? Explain.
- c) Derive the emf equation for an AC machine. What is pitch factor?
- d) Bring out the characteristics of two alternators working in parallel. What is the effect of change in excitation and change in mechanical power input on load sharing?
- e) Draw a phasor diagram of a salient pole synchronous motor. Derive the power angle characteristics.

SECTION C**3. Attempt any one part of the following:****7 x 1 = 7**

- a) Draw the equivalent circuit of a single phase induction motor. How can the performance of the motor be analyzed?
- b) Explain the operation of a single phase induction motor on the basis of (i) double revolving field theory (ii) cross-field theory.

4. Attempt any one part of the following:**7 x 1 = 7**

- a) Explain the phenomenon of cogging and crawling in a 3-phase induction motor.
- b) Draw and explain the phasor diagram of a 3-phase induction motor.

5. Attempt any one part of the following:**7 x 1 = 7**

- a) Draw and explain the phasor diagram of a synchronous motor operating at (i) lagging power factor (ii) leading power factor.
- b) Explain the sequence of events which take place when the load on a synchronous motor is changed? What is hunting? How can it be avoided?

6. Attempt any *one* part of the following:

7 x 1 = 7

- a) Explain the two reaction theory of salient pole machines. Draw the phasor diagram as per this theory. How can the regulation of an alternator be calculated using this theory?
- b) An AC machine has 6 poles and 96 slots. The coils are wound with 13/16 fractional pitch. Find pitch factor for fundamental.

7. Attempt any *one* part of the following:

7 x 1 = 7

- a) What is Hopkinson test? Draw a diagram and explain the procedure of this test. What are the advantages of this method of testing?
- b) Derive an equation for the short circuit current amplification of a compensated cross-field machine.

