

BTECH
(SEM-IV) THEORY EXAMINATION 2018-19
ELECTRICAL MACHINES AND CONTROLS

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. What are the properties of Ideal Transformer?
- b. What is transfer function? Explain Poles and Zeros of transfer function.
- c. Write the rules for Block diagram reduction.
- d. Write the difference between open loop and closed loop system.
- e. What is Synchronous Condenser?
- f. Define static and dynamic system.
- g. List the feature of AC servo motor.

SECTION B

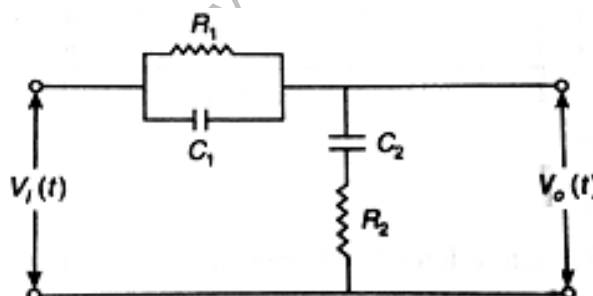
2. Attempt any *three* of the following: 7 x 3 = 21

- a. Derive equation of torque developed by 3 phase induction motor. Draw typical torque slip curve and the deduce condition for maximum torque.
- b. Derive the Expression for EMF equation of transformer and list the losses in transformer.
- c. Write the difference between Synchronous motor and Induction Motor.
- d. Derive the Expression of Slip in 3-Phase Induction motor. What is the value at starting and at synchronous speed.
- e. Discuss the PI and PD controller with their application.

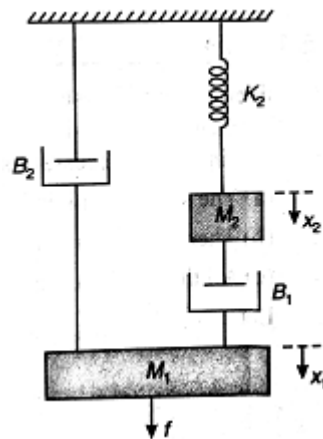
SECTION C

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

- (a) Derive the transfer function of the R-C network of a given network.



- (b) Draw the free body diagram and write the differential equation of the given system shown in figure.



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

- (a) A second order system is given by

$$C(s) = \frac{25}{s^2 + 6s + 25}$$

Find its rise time, peak time, peak overshoot and settling time if subjected to unit step input. Also calculate expression for its output response.

- (b) Explain Single Phase Induction motor and give its two applications.

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

- (a) Discuss the Speed Control methods of DC Motor.
 (b) By means of Routh Stability, determine the stability of the system represented by the characteristics equation $s^5 + 4s^4 + 8s^3 + 8s^2 + 7s - 4 = 0$

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

- (a) Name the various methods of Starting of poly phase induction motor and describe one method in detail.
 (b) The transfer function of a unity feedback system is given by

$$G(s) = \frac{K}{s(s+4)(s+5)}$$

Sketch the root locus as K varies from zero to infinity.

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

- (a) Construct the bode plot for a Unity feedback control system having transfer function

$$G(s) = \frac{1000}{s(s+1)(s+100)}$$

And determine Phase margin and Gain Margin.

- (b) Draw the polar plot for

$$G(s) = \frac{6}{(s+1)(s+2)}$$