

B TECH
(SEM- IV) THEORY EXAMINATION 2018-19
ELECTRICAL MACHINES & CONTROLS

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION-A

1. Attempt all questions in brief.

2 x 10 = 20

- a. Define the voltage regulation of a transformer.
- b. Why core loss is neglected in short circuit test and copper loss in open circuit test?
- c. Why starter is needed in dc motor?
- d. Why iron losses in rotor of induction motor are neglected?
- e. Why a 3-phase synchronous motor always runs at synchronous speed?
- f. Define the transfer function of a system. What are its limitations?
- g. Sketch various test signals and give their mathematical representation.
- h. Give four advantages of Routh's criterion.
- i. Define resonant peak and resonant frequency.
- j. Define cut- off frequency and cut-off rate.

SECTION-B

2. Attempt any three of the following:

10 x 3 = 30

- a. Explain with neat sketch the speed control of dc motor by Ward-Leonard method.
- b. Explain the working of two phase ac servo motor, draw its torque speed characteristics and write their various applications.
- c. Find out C(s)/R(s) for the following systems given below-

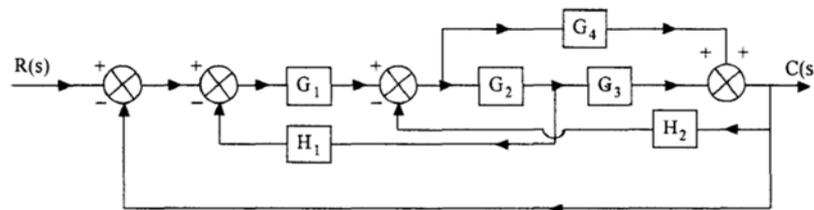


Fig.1

- d. A system is given by differential equation, $\frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} + 8y = 8x$. Where y=output and x= input. Determine rise time, peak time, peak overshoot and settling time if subjected to unit step input.
- e. Derive expressions for resonant peak and resonant frequency.

SECTION-C

3. Attempt any one part of the following:

10 x 1 = 10

- (a) Determine the expression for saving of copper in an autotransformer as compared to two winding transformer. What are the advantages, disadvantages and applications of autotransformer
- (b) Discuss armature control method of speed control of dc shunt motor. A 440 V The armature resistance of a 200 V d.c. shunt motor is 0.12 Ω . It runs at 600 rpm at constant torque load and draws a current of 21 A. Calculate its new speed if the field current of the motor is reduced by 10%.

4. **Attempt any one part of the following: 10 x 1 = 10**

- (a) Derive the equation for the torque developed by a three-phase induction motor. Draw a typical torque slip curve and deduce the condition for maximum torque.
- (b) A 4-pole, 3-phase, 50Hz, star connected alternator has 60 slots, with 2 conductor per slot and having armature winding of two layer type. Coils are short-pitched in such a way that if one coil side lies in slot number 1, the other lies in slot number 13. Determine the useful flux per pole required to generate a line voltage of 6000 V

5. **Attempt any one part of the following: 10 x 1 = 10**

- (a) Develop the block diagram of armature controlled D.C. motor and find out transfer function.
- (b) For mechanical system shown in Fig, draw mechanical network, write differential equation of performance and also draw force-current and force voltage analogous networks.

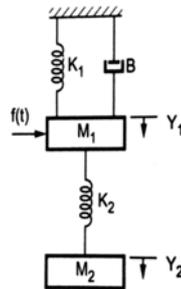


Fig.2

6. **Attempt any one part of the following: 10 x 1 = 10**

- (a) The open loop transfer function of a unity feedback control is given by;

$$G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$$

Determine the value of K

1. For which the system is stable.
 2. For which the system is marginally stable.
 3. Calculate frequency of sustained oscillation.
- (b) Draw the polar plot for the following transfer functions

$$(a).G(s) = \frac{1}{s(s+1)}, \text{ and } (b).G(s) = \frac{1}{s^2(s+1)}$$

7. **Attempt any one part of the following: 10 x 1 = 10**

- (a) Sketch the root locus for the following system

$$G(s)H(s) = \frac{K}{s(s+2)(s+4)(s+8)}$$

- (b) Sketch the bode plot for a feedback system with loop transmittance

$$G(s)H(s) = \frac{100}{s(s+0.5)(s+10)}$$

And find Gain cross over frequency, Phase cross over frequency, Gain margin and Phase margin, Comment on the closed loop stability.