Paper Code: EE-409 **Roll No.** | | | | | | | | | | |

B.Tech.
(SEM IV) EVEN SEMESTER EXAMINATION, 2015-16
ELECTRICAL MACHINES & AUTOMATIC CONTROL

[Time: 3 hrs.] **[Max. Marks: 100]**

1. Attempt any four parts of the following:- **[5x4 = 20]**

(a) Explain Open circuit test and short circuit test.
(b) Derive the emf equation of a transformer.
(c) Why is starter necessary for starting a dc motor? Explain the working of 3-point starter.
(d) Explain flux control method for speed control of dc shunt motor.
(e) A 300/200 V, 50 H_Z single phase transformer has core area 150 cm^2 and 80 turn in LV winding. Calculate maximum flux density in the core.
(f) Derive expression for maximum efficiency of transformer.

2. Attempt any two parts of the following:- **[10x2 = 20]**

(a) Explain construction of an induction motor in detail.
(b) Explain V-curve and inverted V- curve.
(c) Explain torque slip characteristics, application and advantage of servomotor.

3. Attempt any four parts of the following:- **[5x4 = 20]**

(a) Write the differential equation of the system shown below fig 1. And draw electrical analogous system

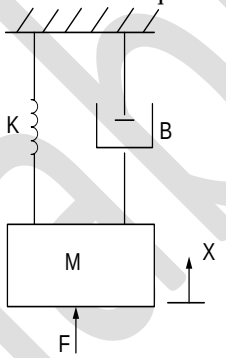

Fig 1

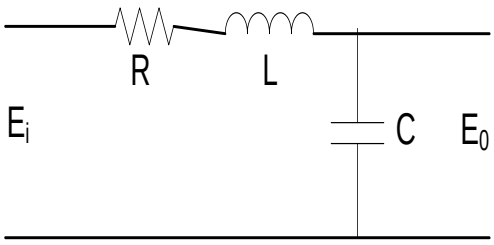

Fig 2

(b) Obtain the transfer function of the network shown in fig 2.
(c) Distinguish between open loop and control system with example.
(d) Define the terms plant, process, system, and disturbance.
(e) Explain force- current analogy of translational mechanical system.
(f) What is a test signal? Give the different types.

4. Attempt any two parts of the following:- **[10x2 = 20]**

(a) A 2nd order system given as $\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}$. Calculate t_r, t_p, t_s, M_p. if subjected to unit step input also give expression for its output response.

(b) For unity feedback control system $G(s) = \frac{k(s+1)(s+2)}{(s+0.1)(s-1)}$. Determine characteristics equation and range of k for stable system

(c) Sketch nyquist plot of the system $G(s)H(s) = \frac{k}{s(Ts+1)}$. Also comment on stability.

5. Attempt any two parts of the following:- **[10x2 = 20]**

(a) Sketch Root locus of unity feedback control system has open loop system $G(s) = \frac{k(s+1)}{s^2(s+3.6)}$

(b) How to obtain Gain Margin and Phase margin from polar plot. Define stability condition for polar plot.

(c) Write short notes on P, I, PID controllers.