END SEMESTER EXAMINATION

CONTROL SYSTEM ENGINEERING

COURSE:- B-Tech ASE+AVE **COURSE CODE:- ELEG-271**

SEMESTER:- VIII **TIME- 3:00 hr**

Section-A (Low Difficulty Questions) **5*6 = 30 M**

1.The characteristics of negative feedback control system are------------------------

2. The components of feedback control system are------------------------

3. Output matrix of control system is given as y= [1 -1 1][x_1; x_2;x_3]. The value of system observability is ----------------------

4. If G(s) H(s) = k(s+3)/ s(s+10)(s^2 +8s+20) is a transfer function. angle of asymptotes ---------

5. The state equation for a system follow $\dot{Z} = AZ + B\eta$, Y = C z A= [-3 6; 0 0] , B=[0; 3] , C= [1 0]. state whether system is controllable or not **True/False**

6. The characteristic equation of second order differential equation is s^2+s+1.The maximum peak overshoot is ---------------

Section-B (Mid- Level Difficulty Questions) **10*5 = 50M**

7. Explain the following: a) Transmittance b) node c) Forward path gain d) Individual loop e) loop gain

8. Explain the following: a) Compensators b) series compensators c) feedback compensators d) forward compensator e) PID Controller

9. Given the following transfer function. Determine steady state error of the system to unit step, ramp, and parabolic inputs if G(s) H(s) = k(s+2)/ s(s+1)(s+4)(s+5)

10. Explain the following: a) settling Time b) Rise Time c) Peak overshoot d) Delay Time e) PI Controller.

OR

Explain the following: a) Gain Margin b) phase Margin c) Band width d) cut-off rate e) Resonant frequency

11. Construct the Routh array and determine the stability of the system whose characteristic equation is $s^5+s^4+3s^3+3s^2+4s+6=0$. determine the no of roots lying on the left half of the s-plane, right half of the s- plane & on the imaginary axis.

Section-C (High Level Difficulty Question) **20*1 = 20 M**

12.Given state space equation as ϋ= Au +Bŋ where A= [0 -1 -3; -6 0 -2; -5 -2 -4],B =[0 ; 1 ; 1].

a) Determine the transformation matrix P so that new state equation are in Jordan canonical form.

b) The transfer function for a feedback control system follow. Determine state space equations and output equation for closed loop system $G(s) = s^2 +2s +2/s^3 +2s^2+3s+1$

OR

An open-loop control system has the following state space model A= [0 1 0; -1 0 2; -4 -2 -2] , B= [0 ; 2; 1].

a) Determine characteristic equations and eigen values for the open-loop system.

b.) Locate the closed loop eigen values at $\lambda_1 = -5$, $\lambda_2 = -2+ 3i$, $\lambda_3= -2-3i$ by using Bass-Gura method