Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Aerospace Engineering) (2012 Onwards) (Sem.–5)

CONTROL ENGINEERING

Subject Code : ASPE-304

M.Code : 71838

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Block representation of system elements

b) Bode attenuation diagram

c) Concept of automatic control

d) Proportional controller

e) Phase margin

f) Closed loop system

g) Modern control theory

h) Relative stability

i) Mason's Gain formula

j) Polar plot

SECTION-B

2. Determine whether the characteristic equation given below has stable or unstable roots.(5)

$$2\lambda^3 + 4\lambda^2 + 4\lambda + 12 = 0$$

3. How addition of poles and zeros affect the stability characteristics of a closed loop system? (5)

4. Illustrate the first order system response to step, ramp and impulse input with the help of examples.

5. Distinguish between 'PI' and 'PID' controllers. (5)

6. Write short notes on 'M & N Circles'. (5)

SECTION-C

7. What do you mean by compensation? Explain Series and Feedback compensation. Discuss the physical devices used for system compensation. (2, 4, 4)

8. An airplane is found to have poor short period flying qualities in a particular flight regime. To improve the flying qualities, a stability augmentation system using state feedback is to be employed. Determine the feedback gains so that the airplane's short period characteristics are $\lambda_{sp} = -2.1 \pm 2.14i$. Assume that the original short period dynamics are given as : (10)

$$\begin{bmatrix} \Delta\dot{\alpha} \\ \Delta\dot{q} \end{bmatrix} = \begin{bmatrix} -0.334 & 1.0 \\ -2.52 & -0.387 \end{bmatrix} \begin{bmatrix} \Delta\alpha \\ \Delta q \end{bmatrix} + \begin{bmatrix} -0.027 \\ -2.6 \end{bmatrix} [\Delta\delta_e]$$

9. What do you mean by transfer function and transfer function models? Explain the transfer function models for mechanical and thermal systems with the help of examples.(4, 6)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.