M. TECH.-II (MECHANICAL CAD/CAM) (CBCS – 2015 COURSE) : WINTER - 2017

SUBJECT : CONTROL SYSTEMS

Day : **Tuesday**
Date : **28/11/2017**

Time : **11.00 AM TO 02.00 PM**
Max. Marks : 60

W-2017-2817

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer books.
4) Draw neat and labelled diagram **WHEREVER** necessary.
5) Use of non-programmable calculator is **ALLOWED**.
6) Assume suitable data, in necessary.

SECTION – I

Q. 1 Draw and explain in brief functional block diagrams of following applications of control system. **(10)**

a) Sun-tracking control system

b) Shaft speed control system

OR

Explain the features of the following: **(10)**

a) PI controllers

b) PID controllers

Q. 2 Explain with neat sketch steady state errors and static error constants. **(10)**

OR

Classify and explain in detail standard test signals given to control system. **(10)**

Q. 3 Discuss the stability of the third order control system whose characteristic equation is given below. Use Routh-Hurwitz's criterion. Also find value of k for stability $s^3 + 3408.3s^2 + 1,204,000s + 1.5 \times 10^7 \ k = 0$. **(10)**

OR

Discuss stability of the control system by using Routh-Hurwitz's criterion **(10)**

$s^6 + 4s^5 + 3s^4 + 2s^3 + s^2 + 4s + 4 = 0.$

SECTION - II

Q. 4 What are frequency response specifications? Derive the co-relation between M_r and W_r. **(10)**

OR

For $T(s) = \dfrac{64}{s^5 + 5s + 64}$. Find frequency response specifications. **(10)**

P. T. O.

Q. 5 Define and explain the following terms: **(10)**

i) State variables

ii) State vector

iii) State space

iv) State trajectory

OR

Obtain the state model for system represented by: **(10)**

$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 10y = 3U(t)$. Also Draw the state diagram.

Q. 6 Draw schematic diagram of a potentiometer and explain its use in control systems. Also state its important characteristics. **(10)**

OR

Write a short notes on : **(10)**

a) Optimal Control Systems

b) Adaptive Control Systems

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