15-06-2026 SE EXTC SEM-III C SCHEME EICS QP CODE: 20013835

Time: 3 hours **Marks: 80**

(1) Question No. 1 is compulsory.
(2) Attempt any three questions from the remaining five questions.
(3) Assume suitable data if needed.

Q1. Attempt any four **20**

a. Discuss the effect of feedback on system stability, gain, and bandwidth.
b. What do you understand by passive transducers? Describe one passive transducer in detail.
c. Explain types of errors encountered in the measurement system.
d. Explain measurement of inductance using a bridge circuit with a neat labelled diagram.
e. Find rise time, peak time and settling time for a second order system having transfer function $(s) = \frac{16}{s^2+8s+16}$, when subjected to a unit step input.
f. A servo system requires fast response, low overshoot and high disturbance rejection. How to analyse the system and design controller for the same?

Q2 Answer the following **20**

a. Using Routh's stability criterion, find range of K for the stability of the system $s^4 + 2s^3 + 3s^2 + Ks + 1 = 0$.
b. Define steady-state error and static error constants. For unity feedback system $(s) = \frac{10}{s(s+2)}$, find steady-state error for step input and ramp input.

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Q3 Answer the following **20**

a. Define a polar plot. How is it constructed for a given transfer function? How stability information can be inferred from a polar plot.
b. Obtain overall transfer function of the system shown in figure using Mason's gain formula:

Q4. Answer the following **20**

a. Explain the working principle of LVTD with a neat sketch.
b. For the given unity feedback system $G(s)H(s) = \frac{k}{s(s+8)(s+2)}$, sketch the root locus and find gain K for which system becomes marginally stable.

Q5. Answer the following **20**

a. Draw Bode plot for a unity feedback control system with open loop transfer function$G(s) = \frac{50(s+1)}{s^2(s+10)}$. Also find gain crossover and phase crossover frequencies.
b. Discuss the working principle of Resistance Temperature Detector (RTD) and its use in detail.

Q6. Answer the following **20**

a. Explain working of Kelvin's bridge in detail.
b. Draw a block diagram of an instrumentation system and explain its each block.

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