

Duration: 3hrs

[Max Marks: 80]

- N.B.:** (1) Question No 1 is Compulsory.
 (2) Attempt any three questions out of the remaining five.
 (3) Figures in the right margin indicate the marks.
 (4) Assume suitable data, if required and state it clearly.

- 1** Attempt any **FOUR** [20]
- a Compare accuracy and precision with suitable examples. [5]
- b Using Routh's stability criterion, comment on the stability of the given system, having the characteristic equation $s^4+4s^3+13s^2+36s+5=0$. [5]
- c What are active and passive transducers? Explain the various criteria for the selection of a particular transducer. [5]
- d Explain how stability of the system can be analyzed using the Nyquist plot. [5]
- e Explain the correlation between the time domain and frequency domain characteristics. [5]
- 2** a Explain with a neat diagram the working principle of LVDT. State one application of LVDT. [10]
- b Discuss the working principle of Resistance Temperature Detector (RTD) and its use in detail. [10]
- 3** a Derive expression for inductance measurement using Hay's bridge along with a neat diagram. [10]
- b Explain Kelvin's double bridge and its application in very low resistance measurement. Derive the balanced equation of Kelvin double bridge. [10]
- 4** a Sketch the root locus for the system with an open-loop transfer function given by [10]
- $$G(s)H(s) = \frac{K}{s(s+1)(s+3)}$$
- b Sketch the Bode diagram for the following transfer function and obtain Gain margin and Phase margin. [10]
- $$G(s)H(s) = \frac{0.75(1+0.2s)}{s(1+0.5s)(1+0.1s)}$$
- 5** a Sketch the polar plot for the system with an open-loop transfer function given by [10]
- $$G(s)H(s) = \frac{1}{s(s+2)}$$
- b For a unity feedback system having open loop transfer function $G(s)H(s) = \frac{10(s+3)}{s(s+1)(s+2)}$. Find i) Position error constant ii) Velocity error constant and iii) Acceleration error constant. [10]

- 6 Attempt any **FOUR** [20]
- a Define the terms a) hysteresis b) sensitivity and d) linearity. [5]
 - b Write a short note on Mason's gain formula and its use. [5]
 - c Explain performance characteristics of a second order system. [5]
 - d Draw the phasor diagram and derive the balanced equation of Schering bridge for the measurement of unknown capacitance. [5]
 - e Explain the lead compensator in detail. [5]
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