Roll No.

Total No. of Pages : 03

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M.Tech. (Mechanical Engineering) (Sem.–3) INSTRUMENTATION AND CONTROL ENGINEERING Subject Code : MTME-222 M.Code : 74998 Date of Examination : 02-01-23

Time: 3 Hrs.

Max. Marks: 100

INSTRUCTIONS TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT question.
- 2. Each question carry TWENTY marks.
- 1. a) Explain the construction and working of PMMC instrument. Derive the equation for deflection if the instrument is spring controlled.
 - b) The four arms of Hay's alternating current bridge are arranged as follows: AB is a coil of unknown impedance: BC is a non-reactive resistor of 1000 Q: CD is non-reactive resistor of 833 Ω in series with a standard capacitor of 0.38 μ F. : DA is a non-reactive resistor of 16800 Ω If the supply frequency is 50 Hz, determine the inductance & resistance at the balance conditions. Derive the conditions for the balance and draw the phasor diagram under the balance conditions.
- 2. Explain :
 - i) Fixed and variable AF oscillators
 - ii) Square and pulse generator
- 3. Differentiate between the following by considering suitable examples
 - i) Open loop and closed loop systems
 - ii) Continuous and sampled data control systems
 - iii) Linear and non-linear systems
 - iv) Time variant and time invariant systems

4. a) Determine the transfer function of the Signal Flow Graph shown below :



b) On the basis of force current analogy write the equations and find $F(s)/X_1(s)$ & $F(s)/X_2(s)$ for the system given below



- 5. The open-loop transfer function of a unity feedback system is $(s) = \frac{4}{s(s+1)}$. Determine the nature response of the closed loop system for a unit step input. Also determine the rise time, peak time, peak overshoot and settling time.
- 6. Explain
 - i) Magnetic amplifier
 - ii) AC and DC techno-generators
- 7. a) Using Nyquist Criterion investigate the closed loop stability of the system whose open loop transfer function is given by $G(s) H(s) = \frac{K}{s(sT_1+i)(sT_2+1)}$

b) Construct the Bode plot of the system whose open loop transfer function is given by

$$G(s)H(s) = \frac{4}{s(1+0.5s)(1+0.08s)}$$

- 8. Discuss
 - i) Anderson's and Schering bridge
 - ii) Routh -Hurwitz criterion with examples of each case

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