

Instructions:

1. **Question 1 compulsory.**
2. Attempt any **three** questions from the remaining **five** questions.
3. Assume suitable data, **if necessary.**
4. **Figures/sketches** carry weightage.

- Q1) a) Explain the constructional features and working of non-contact type of velocity measurement device with a neat sketch 10
- b) Explain the generalized measurement system with a neat sketch and example 10
- Q2) a) Explain Interfering input, Desired input and Modifying input for measurement 7
- b) What do you understand by Mathematical modelling? What is its significance and practical applications? Comment. 7
- c) Illustrate the working principle of "L.V.D.T." for displacement measurement. 6
- d) 8
- Q3) a) Illustrate the working of Nozzle Flapper with a neat sketch 8
- b) The output power of a rotating shaft is measured by a dynamometer. The relationship for output power is - 12

$$P = \frac{2\pi \times 9.81 \text{ FLR}}{t \times 10^6} \text{ KW}$$

Where;

F = Force at the end of torque arm, kg ;

L = Length of torque arm, mm ;

R = Number of revolutions during time t,

t = Time for test run, S.

The test data are -

F = 4.58 ± 0.02 kg

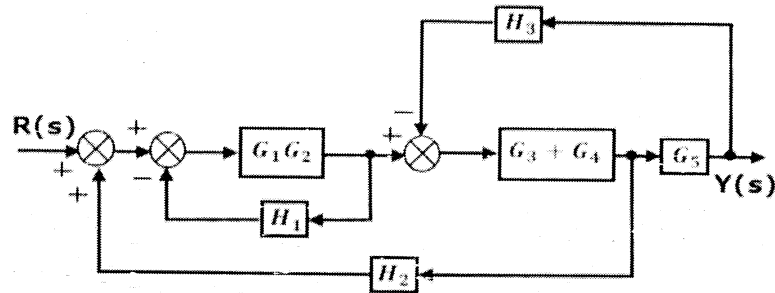
L = 397 ± 1.3 mm

R = 1202 ± 1.0 revolutions

t = 60 ± 0.50 second

The errors are limiting (absolute) errors. Determine the magnitude of power and magnitude of the limiting error in the computed power

- Q4) a) Obtain the Transfer function for the Block diagram using Standard Block reduction rules. 10



- b) Enumerate the types of pressure measurement devices w.r.t. to pressure levels to be measured. State the working principle of any one transducer for each pressure level. 10
- Q5) a) Unity feedback system has open loop T.F. $G(s) = K / s(1+Ts)$ where K and T are constants. Determine factor by which gain K should be multiplied so that overshoot of unit step response be reduced from 75% to 25% 10
- b) Sketch the Root Locus for the given system having $G(s) \cdot H(s) = K(s+4) / (s^2 + 2s + 2)$. Comment on its stability. 10
- Q6) a) Write short note on PI & PID controllers. 10
- b) A system having, 10

$$G(s)H(s) = \frac{K(s+2)}{s(s+4)(s+10)}$$

Find K to get $PM=30^\circ$