NANYANG TECHNOLOGICAL UNIVERSITY

SEMESTER 2 EXAMINATION

2016-2017

MA2011 - Mechatronics System Interfacing

May 2017 Time Allowed: 2 hours

INSTRUCTIONS

1. This paper contains FOUR (4) questions and comprises FOUR (4) pages.
2. Answer ALL questions.
3. All questions carry equal marks.

---

1. A first-order instrument is measuring a periodic signal.

(a). What is the magnitude ratio of the instrument in terms of time constant (τ) and angular frequency (ω)? What is the dynamic error?

(6 marks)

(b). If δ is a dynamic error that the measurement system can be tolerated, determine the maximum frequency (ω_{max}) of a periodic input that can be measured.

(7 marks)

(c) Assuming the periodic signal has a single frequency f=50 Hz with sensitivity K=1, estimate the range of the time constant τ given the output amplitude of the signal varies from 50 and 100 units, and the dynamic error to be less than 1%. Discuss the relationship between the time constant, system time response, and dynamic error.

(12marks)

2. Identify three pairs of operational amplifiers with opposite functions.

(a) Show the three pairs of amplifiers with their names, functions, schematic diagrams and equations

(15 marks)

(b) Compare each pair of amplifiers.

(10 marks)