



FIJIANATIONAL UNIVERSITY

College of Engineering, Science and Technology (CEST)

School of Electrical & Electronic Engineering

BACHELOR IN ENGINEERING (ELECTRICAL & ELECTRONICS), YEAR 3

EEE713 – PRINCIPLES OF MEASUREMENT & INSTRUMENTATION

RESIT EXAMINATION - TRIMESTER 2

DAY/DATE: FRIDAY - AUGUST 18, 2017. TIME: 9.00am - 12:10pm.

INSTRUCTIONS TO CANDIDATES:

1. You are allowed 10 minutes Extra reading time during which you are NOT to write.
2. Begin each question on a fresh page and use both sides of the sheet.
3. Write your candidate – number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Answer all FIVE (5) questions in this examination. Each question carry equal marks.
8. Only Non-programmable calculators are permitted into the examination hall.
9. CANDIDATES ARE NOT ALLOWED TO EXCHANGE NOTES OR MATERIALS DURING THE COURSE OF THIS EXAMINATION.

Q1.

- (a) State clearly the significance of the characteristics of measuring instruments in, say, technical Measurement. Make reference to reliability in any given technical situation? (4 marks)
- (b) With the use of a block diagram show the element of a basic measurement instrument system and identify the main functional elements. (5 marks)
- (c) Explain clearly the following terms in the context of scientific measurement: accuracy and errors, reproducibility, true root mean square and calibration in measurement. (5 marks)
- (d) Assess the measurement systems which are available in the market today and select one for accuracy and low quality factors. Justify your selection by referring to the distinct advantages or disadvantages of the choice. (6 marks)

[Total; 20 marks]

Q2.

- (a) Write briefly about the basic components of a data acquisition system and mention the significance of the IEEE488 bus in this system. (7 marks)
- (b) Transducers are important entities in electrical and electrical and electronic systems, Name the five transducers which are quite common and explain briefly how each operates. (7 marks)
- (c) (i) What is an optical power meter and write briefly about how it works. Which equipment can measure the power in optical signals
(ii) How accurate is the optical power meter by National Institute of Standards and Technology (NIST)(US). (6 marks)

Q3.

- (a) Provide a comparative assessment of analog measuring instruments against the digital counterparts under various parameters which either favors or demerits either type in any technical situations. Give a brief account of the Q-meter and it's application. (6 marks)
- (b) Write about the principles of operations of operation of a moving-iron meter. Also state it's advantages and applications. (5 marks)
- (c) Electronic oscilloscope is a useful visual displaying instrument in electrical measurements. Describe its operation and which electrical entities it can measure. (6 marks)
- (d) Steady state and transient response are important phenomenon in electrical and electronics systems. Explain your understanding of these two phenomena. (3 marks)

[Total: 20 marks]

Q4.

- (a) Write an account of an actuator and mention the principles of its operation in terms of digital instruments. Name also the various types which are readily available in the industries today. (5 marks)
- (b) Make an assessment of the cascade control and digital control and comment on their suitability in the situation of their application. (5 marks)
- (c) Analyse and compare the analog and digital techniques of measuring the noise power ratio. State the significance of this technique in measurement for system performance assessment. (5 marks)
- (d) Instrument error is prevalent in electrical and electronic industries. Give an account of your understanding about the relevance of this statement to digital measurement. (5 marks)

[Total: 20 marks]

Q5.

- (a) Explain clearly what signal generators are and classify them as measuring instruments which are frequently available in the electrical and electronic industries. (4 marks)
- (b) Thermocouples are useful measuring devices in electrical systems. What does it measure and use a diagram to explain how it functions. (6 marks)
- (c) In digital systems digitalisation is essential. Write an account of this process regarding a received analog signal. In doing so include the sampling circuits, encoder and multiplexer and explain how they function. (6 marks)
- (d) With the aid of a diagram explain the functions and applications of the spectrum analyser and the frequency synthesizer in measurement. (4 marks)

[Total: 20marks]

The End

