



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EED 213: ELECTRICAL MEASUREMENTS AND TESTING III

DATE: 10/5/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) Define the term maintenance (1 mark)
- b) List three merits of carrying maintenance on an equipment (3 marks)
- c) Describe three types of maintenance (9 marks)
- d) Discuss the various classifications of failure (8 marks)
- e) Distinguish between MTTF and MTBF (4 marks)
- f) Explain three factors affecting reliability of an equipment (5 marks)

QUESTION TWO (20 MARKS)

- a) With an aid of a labeled diagram, explain the '*failure rate variations with time*' for an equipment (7 marks)
- b) In a test in production of resistors, 500 resistors were operated over a period of 10,000 hours. Out of this number, 5 resistors failed. Determine the
 - i. average failure rate in percentage
 - ii. failure rate per hour
 - iii. MTTF (7 marks)

- c) A circuit is made up of four types of components as follows; 20 transistors, 50 resistors, 35 capacitors and 15 switches. If the average failure rate in ($\times 10^{-6}/h$) is 0.07, 0.03, 0.1 and 0.2 respectively, determine
- Circuit failure rate
 - MTBF
- (6 marks)

QUESTION THREE (20 MARKS)

- a) An airport radar system has an estimated MTBF of 15,000 hours. Determine the probability of it working successfully for each of the following times
- 200 hours
 - 10,000 hours
- (4 marks)
- b) Determine the unreliability of the radar system in (a) above if operated for 12,000 hours
- (3 marks)
- c) i Describe the term availability
- ii An instrument has an MTBF of 2000 hours and an MTTR of 50 hours. Determine its percentage availability.
- (4 marks)
- d) State five factors affecting MTTR.
- (5 marks)
- A power supply, oscillator and amplifier are all used in a system. If the MTBFs are 25,000 hrs, 80,000 hrs and 50,000 hrs respectively and the system is operated for 1000 hrs. Determine
- Individual reliabilities
 - System reliability
- (4 marks)

QUESTION FOUR (20 MARKS)

- a) Distinguish between systematic and random testing methods
- (4 marks)
- b) With an aid of a diagram describe the half-split method of fault location
- (7 marks)
- c) A system has 100 blocks, determine the number of checks when using
- input/output method
 - half-split
- (6 marks)
- d) State three assumptions when applying the half-split method of fault location
- (3 marks)

QUESTION FIVE (20 MARKS)

- a) Describe the term hazardous area (2 marks)
- b) State with a reasons four hazardous areas and the measures for counteracting the effects. (8 marks)
- c) Describe two electrical wiring systems used in hazardous areas (8 marks)
- d) State two relevant regulations regarding hazardous area (2 marks)