



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

EED 212: ELECTRICAL INSTALLATION TECHNOLOGY IV

DATE: 25/3/2021

TIME: 11.00-1.00 PM

INSTRUCTIONS

Answer Question One and any Other Two Questions

QUESTION ONE (30 MARKS)

- a) i). Show with a labeled diagram the four main stages of a basic circulation cycle of a vapour compression refrigeration system. (4 marks)
- ii) Explain the three main functions of the thermostatic expansion valve in a refrigeration system. (3 marks)
- b) i) With the aid of a labeled diagram show the Sequence of Control Equipment at the in – take point of a consumers installation. (3 marks)
- ii) State the functions of any three control equipment in Q1b(i) above . (3 marks)
- c) i) State any three advantages of Power factor improvement in a consumer premises (3 marks)
- ii) An Industrial consumer has a maximum load of 200KW at 0.85 Power factor lagging and 80% efficiency per month , with an average load factor of 70% per day for nine hours in a day. If the energy charges are Ksh 120/ = per KVA maximum demand per month plus Ksh 2/50 per unit consumed , Calculate the cost of energy consumed in a month of 28 days with 2% VAT on the monthly cost. (6 marks)
- d) Explain any two factors that may be considered when selecting a motor for a particular Industrial drive. (4 marks)

- e) Define the following types of motor ratings;
- i. Short-time rating
 - ii. Continuous maximum rating
- (4 marks)

SECTION B: ATTEMPT ANY TWO QUESTIONS

QUESTION TWO (20 MARKS)

- a) Describe the following types of motor enclosures;
- i. Screen- protected enclosure
 - ii. Drip-proof enclosure
- (4 marks)
- b) Define the following terms with regard to protection devices
- i. Current rating.
 - ii. Fusing factor.
- (4 marks)
- c) Describe with the aid of a labeled diagram the construction and operation of an Induction type overload relay.
- (8 marks)
- d) An 8 – pole d.c shunt generator has 778 wave - connected armature conductors that runs at 500 r.p.m while supplying a load of 12.5Ω resistance at a terminal voltage of 250 V. If the armature resistance is 0.24Ω and the field resistance is 250Ω , calculate the following;
- i. the armature current
 - ii. the flux per pole
- (4 marks)

QUESTION THREE (20 MARKS)

- a) i Describe with the aid of a labeled diagram the construction and operation of a faceplate starter for a d.c shunt motor with overload and no – voltage protective device.
- (9 marks)
- ii Derive from first principles the expression for the speed equation of a d.c motor.
- (4 marks)
- b) State the following;
- i. The three essential features of a consumers intake point as required by the IEE regulations
 - ii. Any two advantages of Power factor improvement method using synchronous condensers.
- (5 marks)
- c) Define the term “Power factor” .
- (2 marks)

QUESTION FOUR (20 MARKS)

- a) Define the following terms
- i. Demand factor
 - ii. Load factor. (4 marks)
- b) Calculate the cost per year of the energy supplied to a factory, which is loaded daily as follows; (7 marks)
- 250 Kw for 2 hours per day
180 Kw for 8 hours per day
75 Kw for 6 hours per day.
- The charge for the energy is made on the basis of Ksh. 10/ per Kw of maximum demand plus 0.40 cents per unit , for a 5 working day week and 50 weeks per year.
- c) i With the aid of a labeled diagram, explain the Construction of a high – breaking capacity fuse used to protect large industrial loads (7 marks)
- ii State any two disadvantages of a rewirable type of fuse. (2 marks)

QUESTION FIVE (20 MARKS)

- a) State the three laws of thermodynamics with regard to refrigeration and air- conditioning systems. (3 marks)
- b) A current of 35A is drawn from a 240V , 50Hz a.c supply at a Power factor of 0.75 lagging. If a capacitor is required to improve the Power factor to 0.96 lagging, calculate the;
- i. Total current drawn from supply
 - ii. Current drawn by the Capacitor
 - iii. The size of Capacitor in farads (7 marks)
- c) Derive from first principles the expression for the Generated emf equation of a d.c machine. (6 marks)
- d) Define the following types of tariff;
- i. Block rate
 - ii. Two – part (4 marks)