



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 212: ELECTRICAL INSTALLATION TECHNOLOGY IV

DATE: 3/5/2019

TIME: 8.30-10.30 AM

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 $12.5\ \Omega$ resistance at a terminal voltage of 250 V. If the armature resistance is $0.24\ \Omega$ and the field resistance is $250\ \Omega$, 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)