



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION DIPLOMA IN ELECTRICAL
ENGINEERING

EED 203: ELECTRICAL INSTALLATION TECHNOLOGY III

DATE: 19/12/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer Question One and Any Other Two Questions

SECTION A : COMPULSORY QUESTION

1. (a) Explain the following types of a reciprocating compressor. (4 marks)
 - (i) Semi – hermetic
 - (ii) Open – type.
- (b) (i) State any three physical properties of a refrigerant. (3 marks)
 - (ii) Describe the Receiver – drier as a component of a typical refrigeration system. (3 marks)
- (c) (i) Define the term Power factor. (2 marks)
 - (ii) An industrial load of 50kW, 240V, 50Hz is operating at 0.6 power factor lagging and 83.3% efficiency. Determine the value of Capacitor required to improve the overall power factor to 0.87% lagging. (6 marks)
- (d) Explain the following types of tariff
 - (i) Block rate
 - (ii) Two – part (4 marks)

- (e) Describe with the aid of a diagram the operation of a high pressure mercury vapour lamp (8 marks)

SECTION B : ATTEMPT ANY TWO QUESTIONS

2. (a) State the inverse square law of illumination. (2 marks)
- (b) Define the following terms of illumination
- (i) Luminous flux
- (ii) Luminance (4 marks)
- (c) Two lamps P and Q, 4m apart and 3m above the finished floor, illuminate a passage way with each lamp emitting 200 cd. Calculate the illumination on the ground level midway between the lamps. (6 marks)
- d) (i) Define a “ fire – alarm system ” (2 marks)
- (ii) State any two sensing elements used as heat detectors in fire alarm systems. (2 marks)
- (e) Describe the following components of a electric bell system
- (i) Indicator board
- (ii) Bell relay (4 marks)
3. (a) State any three IEE regulations regarding bell transformers. (3 marks)
- (b) Show with a labeled diagram a closed- circuit fire alarm powered by a 24 V d.c supply and is installed in a building divided into three sections to meet the following conditions;
- (i) One bell and two call points required in each section. This bell only rings in the respective section when there is fire.
- (ii) A main bell which rings whenever there is fire in any section.
- (iii) Any section that is on fire is shown through an indicator . (5 marks)
- (c) State any three advantages of Power factor improvement in a consumer premises. (3 marks)
- (d) 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 Ksh120/ = per KVA maximum demand per month plus Ksh2/50 per unit consumed, calculate the cost

of energy consumed in a month of 28 days with 2% V.A.T. on the monthly cost.

(6 marks)

(e) State any three Objectives of an energy tariff. (3 marks)

4. (a) With the aid of a basic cycle diagram explain the four main stages of a vapour compression refrigeration system. (10 marks)

(b) Explain the following terms as used in design of lighting schemes

(i) Utilisation factor

(ii) Maintenance factor. (4 marks)

(c) Define the Cosine law as applied in illumination. (2 marks)

(d) (i) Three different wards in a hospital are provided with a call system. Draw a circuit diagram showing the electrical connections for the system comprising one main bell, reset point, battery and a three-way indicator board (2 marks)

(ii) State any two advantages of open circuit fire- alarm system as compared to closed circuit fire-alarm system. (2 marks)

5 (a) State any three effects of a low Power factor (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 (6 marks)

c) Explain the three main functions of the thermostatic expansion valve in a refrigeration system. (3 marks)

d) A factory has an average load of 200KW for 50 hours per week and a maximum demand load of 260KW at a power factor of 0.8 lagging. If the tariff charge of Ksh. 120/= on fixed charges plus 90 cents per unit consumed plus Ksh.22/= per KVA of maximum demand is to be applied for a month of four weeks , calculate the monthly tariff for the consumer. (4 marks)

e) Define the following terms as applied to an electrical installation

(i) Demand factor

(ii) Load factor. (4 marks)