JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMINATION FOR THE DEGREE IN SCIENCE IN CONSTRUCTION MANAGEMENT

3RD YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR
CENTRE: MAIN CAMPUS

COURSE CODE: TCB 1307

COURSE TITLE: BUILDING SERVICES II

EXAM VENUE: **STREAM: BSc. CONSTRUCTION MGT**

DATE: 7/1/2025 **EXAM SESSION:9-11.00 AM**

DURATION: 2 HOURS

Instructions

1. **Answer question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

Question One

(a) Draw a simple 3 phase power supply diagram showing stages from generation station, substations, transmission and distribution in electrical power to various large, medium and domestic power consumers and outline all the typical voltage at various stages. **[10 Marks]**

(b) Explain the reasons for the use of high voltage transmission in power distribution and methods of stepping up/down the voltages at the at the consumer's premises. **[04 Marks]**

(c) Explain the advantages of AC for transmission and distribution of electrical power and also on the advantages of using 415/240 V four-wire over a single phase. **[06 Marks]**

(d) A domestic installation provides a means of connecting the consumer's electrical power equipment to the electrical power distribution line, draw a neat labelled diagram showing the sequence of connection equipment at the consumer's intake point. What is the function of the arrangement of the control equipment at the domestic consumer's intake point? **[10 Marks]**

Question Two

(a) Explain clearly, giving three main reasons why is it necessary for the incoming power supply has to be of 3- phase-4-four wire when the sustained power demand of distribution on a medium installation in excess of 12 kW? **[07 Marks]**

(b) Define and explain the meaning of diversity factor. Give the main application of diversity factor, giving examples of where this is used to effect on a domestic installation. **[04 Marks]**

(c) Make a diagram of connections showing the secondary winding of a three phase four wire transformer supplying three single-phase consumer loads**.** **[03 Marks]**

(d) Derive the mathematical relationship between the line and the phase voltages. **[02 Marks]**

(e) If the three single-phase loads, all at unity pf, are 10 A, 20 A, and 30 A respectively, determine the current in the neutral conductor of the three-phase four-wire power supply. Draw the phasor diagram of the three currents to illustrate your answer. [**04 Marks]**

Question Three

(a) Outline the 8 factors that determine the choice of a wiring system. **[08 Marks]**

(b) List the three essential parts of a cable, giving the functions of each part. **[02 Marks]**

(c) What type of wiring system would you recommend for the following installations, giving the reason for each of your recommendation? **[04 Marks]**

(i) Petrol station
(ii) Office block
(iii) Farm settlement
(iv) Distribution in factory
(v) Engineering workshop

(d) An overhead busbar trunking system is often used for supplying machines in an engineering workshop through plug-in-boxes. State two advantages of trunking system compared to conduit system. [**02 Marks]**

(e) State the reason for the reduction of the neutral seize in circuit 1 [**02 Marks]**

(f) If a trunking system had been used for enclosure of the cables, from Table 4G, calculate the minimum size required. **[02 Marks]**

Question Four

(a) Why is it a requirement for a new installation and any alterations to an existing installation should inspected and tested before being connected to the electrical power supply? **[02 Marks]**

(b) The I.E.E Regulations recommends that the above tests and inspection should be carried out in the following sequence:

(i) List the five tests to be carried out before the electrical supply is connected. **[05 Marks]**

2. List the three tests to be carried out with electrical power supply connected. **[03 Marks]**

(c) Briefly explain why it is necessary for following installation tests are carried on a new and any alteration to an existing installation before being connected to the electrical power supply.

(i) Polarity test **[02 Marks]**

(ii) Earth loop impedance test **[02 Marks]**

(iii) Earth electrode test [**02 Marks]**

(iv) Insulation resistance test **[02 Marks]**

(v) Test for ring circuit continuity **[02 Marks]**

Question Five

(a) State what is meant by the following listed lighting terminologies **[08 Marks]**

(i) Luminous flux
(ii) Luminous efficiency
(iii) Luminous intensity
(iv) Illuminance

(b) The lumen method of lighting design is used to determine a lighting layout that will provide a design-maintained illuminance. Explain very briefly the listed factors given below to be considered for basic design of lighting installation system.

(i) Utilization factor, what does it depend on? **[4 Marks]**
(ii) Maintenance factor **[2 Marks]**
(iii) Space to height ratio **[2 Marks]**

(c) An office 8 m long by 7 m wide requires an illumination level of 400 lux on the working plane. It is proposed to use 80 W fluorescent fittings having a rated output of 7375 lumens each. Assuming a utilization factor of 0.5 and a maintenance factor of 0.8 design the lighting scheme. **[2 Marks]**