

UGANDA MARTYRS UNIVERSITY

FORT PORTAL CAMPUS

**FACULTY:** ENGINEERING AND APPLIED SCIENCE

**DEPARTMENT:** DEPARTMENT OF CIVIL ENGINEERING

**COURSE CODE:** BCE3101: **COURSE NAME:** CONCRETE TECHNOLOGY II

FINAL ASSESSMENT

ACADEMIC YEAR 2023/2024 SEMESTER I

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Date of Examination: 14<sup>TH</sup> DECEMBER 2023

Time allowed: 3 hours (9:00Am – 12:00Pm)

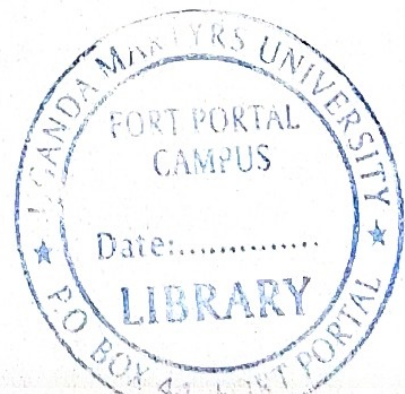
**Instructions to Candidates:**

**Read the following before answering the examination questions.**

- 1) This Exam contains **Six (6)** questions.
- 2) Attempt any **five (5)** questions of your choice.
- 3) All Questions carry equal marks.
- 4) Show all the necessary workings.
- 5) Start each question on a fresh page.
- 6) Read other instructions on the answer booklet.
- 7) Do **NOT** write anything on this question paper.

**You should have the following in this Examination.**

*Answer Booklet, Drawing instruments, graph papers, non-programmable calculator and IEE Tables for the current ratings and voltage drops, 17th edition.*



### Question One

- (a) Define concrete as a structural material used in the construction industry.
- (b) What is the importance of concrete as a structural material.
- (c) Describe the shortcomings of concrete and how to overcome them.
- (d) Describe the properties of structural concrete

2mks

5mks

5mks

8mks.

### Question Two

- (a) With relevant examples, outline the types of loadings in structural concrete
- (b) Briefly describe the most commonly used grades of concrete and clearly state where they are applied.
- (c) Describe design methods utilized for the design of reinforced concrete structures/elements.
- (d) Distinguish between nominal mix and design mix methods. State the differences between the two methods of concrete mix design
- (e) State the factors to be considered during mix proportioning of concrete.

3mks

5mks

3mks

4mks.

5mks

### Question Three

- (a) Define reinforced concrete slabs.
- (b) Outline two ways into which slabs are classified.
- (c) State the differences between the two classes of slabs mentioned above.
- (d) Design a RC slab for a room having inside dimensions 3m x 7m. The thickness of supporting wall is 300mm, the live load on the slab may be taken as  $2\text{KN/m}^2$ . Assume slab is simply supported at the ends. Use M20 and FE415 materials

1mk

1mk

2mks

16mks.

### Question Four

- (a) Briefly explain the term prestressed concrete
- (b) Outline five reasons why we prestress concrete
- (c) With relevant diagrams, distinguish between pre-tensioning and post-tensioning of concrete
- (d) Describe the differences of prestressed concrete over reinforced concrete

2mks

5mks

4mks

3mks



(e) A rectangular concrete beam of cross-section 30 cm deep and 20 cm wide is prestressed by means of 15 wires of 5 mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter of 5 mm, 2.5 cm from the top. Assuming the prestress in the steel as  $840 \text{ N/mm}^2$  calculate the stresses at the extreme fibers of the mid-span section when the beam is supporting its own weight over a span of 6 m. If a uniformly distributed live load of  $6 \text{ kN/m}$  is imposed, evaluate the maximum working stress in concrete. The density of concrete is  $24 \text{ kN/m}^3$

6mks

#### Question Five

(a) Explain the following:

2mks

(i) Axially loaded column

2mks

(ii) Un-Axially loaded column

2mks

(iii) Bi-Axially loaded column

(b) Design a column 3.5m c/c length under a load of 2000KN. Use M20 and Fe 415 steel.

14mks

#### Question Six

Design a reinforced concrete slab for a room measuring  $4 \text{ m} \times 5 \text{ m}$  inside dimensions. The slab carries a live load of  $2 \text{ kN/m}^2$  and is finished with 20mm thick granolithic finishing having unit weight of  $24 \text{ kN/m}^3$ . Use M20 and FE415 materials and the slab is simply supported on all the four edges with corners free to lift width, supporting wall is 300mm.

(a) Determine the type of slab.

2mks

(b) Calculate the depth of the slab

2mks

(c) Calculate the effective span

2mks

(d) Calculate the ultimate load for the slab

3mks

(e) Calculate the bending moments

3mks

(f) Calculate for the reinforcements

4mks

(g) Check for shear and deflection

4mks



END