



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

CERTIFICATE IN CONSTRUCTION TECHNICIAN II (09A)

MATERIALS (IV)

END OF SEMESTER EXAMINATIONS

APRIL/MAY 2010 SERIES

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examinations:

- Answer booklet
- Scientific calculator

This paper consists of **FIVE**, Questions.

Answer Question **ONE** and any other **THREE** Question.

Question ONE

- (a). Outline the manufacturing process of Portland Cement. **(12 Marks)**
- (b). Describe the following types of Portland Cement:
- (i). Rapid hardening
 - (ii). Extra rapid hardening
 - (iii). Extra high early hardening
 - (iv). Sulphate resisting
 - (v). Low heat
- (20 Marks)**
- (c). Briefly, outline the crushing value test of aggregates. **(4 Marks)**
- (d). For each of the admixtures listed below, state any **TWO** reasons that would necessitate its use:
- (i). Accelerator
 - (ii). Retarder
- (4 Marks)**

Question TWO

- (a). Concisely, explain how internal vibration of concrete should be carried out. **(4 Marks)**
- (b). Explain any **TWO** methods of achieving exposed aggregate finish of concrete. **(4 Marks)**
- (c). State the requirements of timber formwork. **(4 Marks)**
- (d). Explain the structural reasons that lead to use of reinforcing steel in the following concrete elements:
- (i). Beams
 - (ii). Columns
- (8 Marks)**

Question THREE

- (a). Mention and describe any **FOUR** different methods of concrete transport. **(8 Marks)**
- (b). Explain the procedure of placing concrete. **(6 Marks)**
- (c). (i). Explain any **TWO** curing procedures of horizontal concrete surfaces. **(4 Marks)**

- (ii). Calculate the concrete curing period in days if the maturity factor is 6000°C hr and average ambient temperature is 20°C . **(2 Marks)**

Question FOUR

Using D.O.E. procedure, design a concrete trial mix, given the following data:

- Characteristic strength – 25N/mm^2 @28days,
- Number of cubes to be cast – 30,
- %age defectives allowed – 5 ($k=1.64$),
- Aggregates:
 - o Course – crushed,
nominal size – 20mm,
 - o Fine – river sand,
Grading zone – 3
- Cement:
 - o Type – ordinary Portland,
 - o Max. content – 550kg/m^3
 - o Min. content – 300kg/m^3
- Water/cement ratio – 0.6 (max.),
- Workability level – 30 – 60mm slump,
- Design tables and charts are attached **(20 Marks)**

Question FIVE

- (a). State the reasons for prestressing concrete. **(8 Marks)**
- (b). Data below relate to a simply supported rectangular beam (400mm depth x 200mm width):
- Effective span $l = 6000\text{mm}$,
 - Design (u.d.I.) load – 85kN,
 - Axial prestressing for $P = 2100\text{kN}$.

Determine the stress distribution at the centre of the beam. **(12 Marks)**