

**GENERAL CERTIFICATE OF EDUCATION BOARD**

Technical and Vocational Education Examination

**BUILDING CONSTRUCTION PROJECT MANAGEMENT 3**

7211

**JUNE 2022****ADVANCED LEVEL**

|                            |                                                          |
|----------------------------|----------------------------------------------------------|
| Specialty Name and Acronym | CIVIL ENGINEERING -BUILDING CONSTRUCTION - CE-BC (F4-BA) |
| Subject Title              | BUILDING CONSTRUCTION PROJECT MANAGEMENT                 |
| Subject Code No.           | 7211                                                     |
| Paper No.                  | 3                                                        |

**Duration: 3 Hours****INSTRUCTIONS TO CANDIDATES****This Paper has Two Sections****Answer THREE Questions in Section A and ONE in Section B.**

All rough work should be done in your answer booklet.

Where necessary use Drawing Instruments and Calculators.

Where applicable use the following data:

- Acceleration due to gravity,  $g$ .....  $9.8 \text{ ms}^{-2}$
- Universal Gas Constant,  $R$ .....  $8.314 \text{ J mol}^{-1} \text{ K}^{-1}$
- Speed of light in Vacuum,  $c$ .....  $3.00 \times 10^8 \text{ m s}^{-1}$
- Avogadro number,  $N_A$ .....  $6.02 \times 10^{23} \text{ mol}^{-1}$
- Density of water,  $\rho_w$ .....  $1000 \text{ kg m}^{-3}$
- Density of mercury,  $\rho_{Hg}$ .....  $13600 \text{ kg m}^{-3}$
- Ratio of specific heat capacities  $C_p/C_v$ .....  $1.40$
- Faraday's constant,  $F$ .....  $96500 \text{ C mol}^{-1}$
- Relative atomic masses.....  $H = 1; C = 12; O = 16; Al = 27$
- Surface area of Trapezium.....  $\frac{1}{2} h (a + b)$
- Volume of a Pyramid.....  $\frac{1}{3} h (a \times b)$
- Volume of a Truncated Cone.....  $\frac{\pi h}{3} (R^2 + Rr + r^2)$
- Area of any regular Polygon.....  $\frac{ns^2}{4 \tan(\frac{180}{n})}$
- Volume of Pyramid Square Frustum.....  $V = \frac{H}{3} (B + b + \sqrt{B \cdot b})$
- Volume of Pyramid Rectangular Frustum.....  $V = \frac{H}{6} [b(2a + a') + b'(2a' + a)]$

**You are reminded of the necessity for good English and orderly presentation in your answer.****Turn Over**

## SECTION A

(Answer THREE Questions from this section)

## Question 1

An Enterprise to construct a 6 floor building can cast 26.250m<sup>3</sup> of concrete in a day.

The company is equipped with a fixed crane that can do 6 rotations in an hour. The duration of a working day is 8 hours.

**You are requested to:**

- Determine the volume of raw materials used daily for concrete given that loss due to mixing is 20% and reduction due to compaction is 8% (5 marks)
- Determine the minimum volume of the concrete mixer to be used for this project (4 marks)
- Given that the skip bucket weighs 150N and the density of freshly mixed concrete is 22KN/m<sup>3</sup>. Determine the weight to be lifted by the crane during the concreting process. (6 marks)
- Considering that work start at 8.00 am every day, and on the day of site meeting work stop at 11.15am; Determine:
  - The number of rotations made by the crane on a site meeting day (4 marks)
  - The volume of raw concrete consumed on a site meeting day (2 marks)
  - The volume of mixed concrete transported by crane on meeting day. (2 marks)
  - The volume of concrete cast on a site meeting day. (2 marks)

**Total (25 marks)**

## Question 2

Your company was in charge with the construction of a monument in a rural area. The different activities are designated with letters as seen on the table here below:

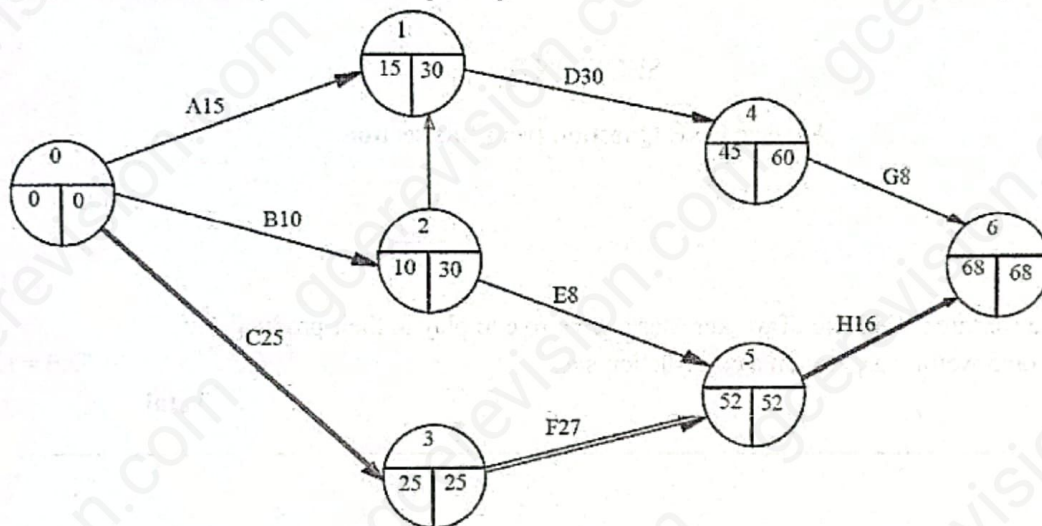
| ACTIVITIES | PRECEDING ACTIVITY | DURATION (DAYS) | NO OF WORKERS |
|------------|--------------------|-----------------|---------------|
| A          | -                  | 4               | 2             |
| E          | -                  | 3               | 2             |
| I          | -                  | 7               | 3             |
| B          | AK                 | 5               | 2             |
| K          | I                  | 2               | 2             |
| J          | I                  | 8               | 1             |
| F          | E                  | 6               | 3             |
| G          | E                  | 15              | 4             |
| C          | B,F                | 10              | 4             |
| M          | J                  | 15              | 3             |
| L          | J                  | 21              | 3             |
| H          | G                  | 9               | 5             |
| D          | C,M                | 17              | 3             |
| N          | L                  | 10              | 3             |

**Work to be done**

- a) Rank the activity (5 marks)
- b) Draw the PERT diagram of the project (7 marks)
- c) Write out the critical path(s) and deduce the duration of the project. (3 marks)
- d) Transform the PERT network to a GANTT (5 marks)
- e) Construct the corresponding manpower diagram (5 marks)

**Total (25 marks)****Question 3**

From the PERT diagram (figure 1), below activity F is laying of precast elements for the realization of a pipe line. A contractor has sub contracted the casting of these elements that make up the pipe line. The firm in charge of the precast elements can precast 7 elements every day and these elements take 4 days to get hardened. Those in charge of laying on the site can lay 14 elements per day. The total number of elements that make up the pipe line are 343.

**Figure 1.****Work Required**

- a) Determine when precast can start so that the laying can continue without any interruption (10 marks)
- b) Determine the maximum quantity that can be stocked on the site in order to determine the stocking area (5 marks)
- c) Draw the graph of evolution of the stock (10 marks)

**Total (25 marks)***Turn Over*

**Question 4**

A concrete mixer truck was purchased at 30,000,000 FRS with a lifetime production of 20,000m<sup>3</sup> and has a residual value of 2,000,000. If the concrete mixer produces for the first year 3200m<sup>3</sup>, second year 4000m<sup>3</sup>, third year 4200 m<sup>3</sup>, fourth year 4400 m<sup>3</sup> and fifth year 4200 m<sup>3</sup>.

- a) Calculate using declined or reduced balance method the redemption plan. (10 marks)
- b) A contractor wishes to know which alternative will be cheaper in buying a site equipment that cost 1,000,000frs or renting the same equipment for 100000frs per month in 1 year; knowing that a year is 12 months.
  - i) Determine the equation of total cost for both alternatives per month. (5 marks)
  - ii) Determine the number of months in which both alternatives will have a common cost (break-even quantity). (5 marks)
  - iii) Draw a graph showing both alternatives within 12 months. Consider the scale 1 cm = 100000 FRS for y – axis and 1cm = 1 month x –axis. (5 marks)

**Total** (25 marks)

**SECTION B**

**Answer ONE Question from this section**

**Question 5**

In a construction site the welfare and health of workers has a great role to play in their productivity.

Name and briefly write on 5 welfare aspects on a construction site.

5X5 = (25 marks)

**Total** (25 marks)

**Question 6**

Two neighbours; Mr. X and Mr. Y own identical adjacent plots. These plots have land titles and are not fenced. Mr X is the first person to construct a building (GF+3) on his plot encroaching into Mr. Y's plot by 2.00m. Mr. Y who was out of the country on return discovered the error and notified Mr. X, who acknowledges it to be true.

**From the above explanation:**

- a) List the various steps to be followed by Mr Y to recover that part of his plot. 2x3= (6 marks)
- b) What can be done by Mr. X to solve the problem (5 marks)
- c) If both parties agree to solve the problem, what become of their land titles and why? (7 marks)
- d) Who takes care of the expenses that may arise in the course of solving this matter and why? (7 marks)

**Total** (25 marks)