2901/103
ENGINEERING DRAWING, WORKSHOP TECHNOLOGY, EHS AND POLICY FRAMEWORK
June/July 2022
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN PETROLEUM GEOSCIENCE

MODULE I

ENGINEERING DRAWING, WORKSHOP TECHNOLOGY, EHS AND POLICY FRAMEWORK

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

- *Answer booklet;*
- *Drawing papers (preferably A3 but A4 may also be sufficient);*
- *Drawing instruments;*
- *A non programmable scientific calculator.*

*This paper consists of **EIGHT** questions in **FOUR** sections; **A**, **B**, **C** and **D**.*
*Answer **FIVE** questions, taking at least **ONE** question from each section in the answer booklet provided.*
Maximum marks for each part of a question are as shown.
Candidates should answer the questions in English.

This paper consists of 6 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A: ENGINEERING DRAWING

*Answer at least **ONE** question from this section.*

1. (a) Figure **1** shows three views of a machine component in first angle orthographic projection.

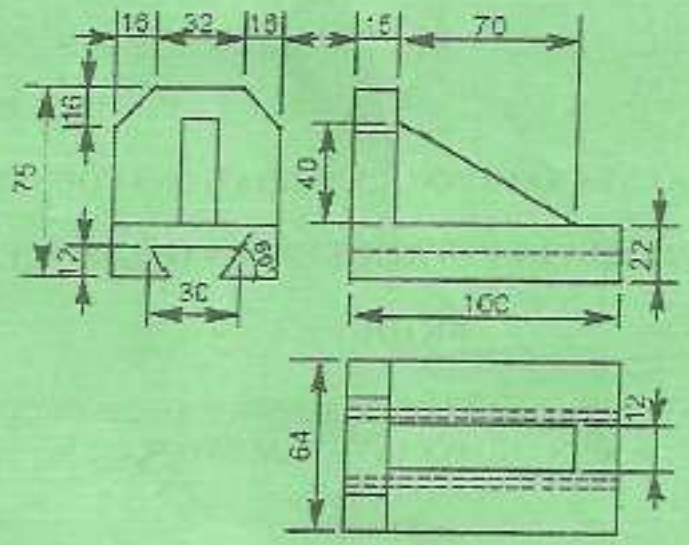

Fig. 1

Reproduce the component in isometric drawing. (14 marks)

(b) Use sketches to show the application of following locking devices:

(i) locking plate;

(ii) split pin. (6 marks)

2. (a) Figure **2** shows a crank OC pin-jointed to link AB at point C. D is a swivel through which the link is free to slide through

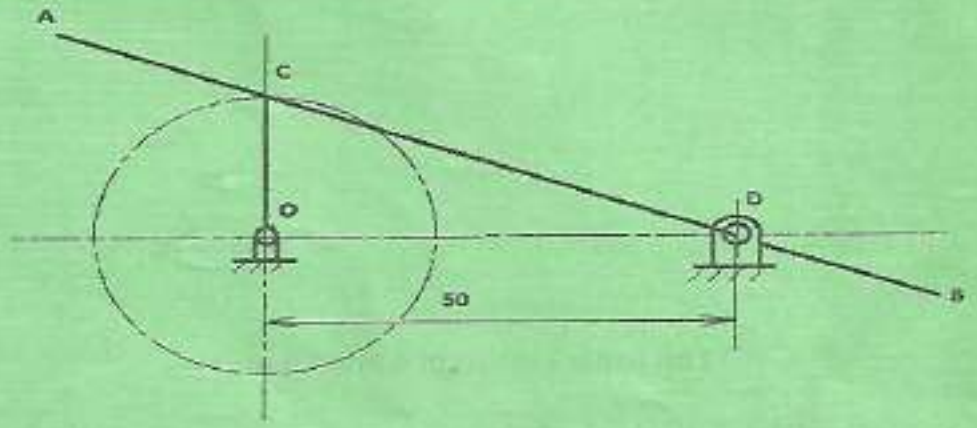

FIGURE 2

Given that AC= 15 mm, DB = 20 mm and OC = 25 mm, copy the diagram and plot the locus of midpoint of the link as the crank rotates in an anticlockwise direction. (11 marks)

(b) Illustrate the **three** types of fit as per the BS4500A. (9 marks)

SECTION B: WORKSHOP TECHNOLOGY

*Answer at least **ONE** question from this section.*

3. (a) Using a diagram describe the left-ward gas welding technique. (5 marks)

(b) Illustrate the following defects that occur in manual metal arc welding:

(i) undercut;

(ii) overlay;

(iii) blowholes. (6 marks)

(c) State the **three** functions of a scribing block. (3 marks)

(d) (i) State **two** types of surfaces produced by a shaper machine

(ii) Describe the quick return mechanism applied in a shaper machine. (6 marks)

4. (a) Describe the black iron material used in sheet metal work. (6 marks)

(b) Using illustrations explain the procedure of making grooved seam joint on two sheet metals using a hand groove tool. (6 marks)

(c) (i) State the function of chuck key in a drilling machine.

(ii) Draw a well labelled diagram of a pillar drilling machine. (8 marks)

SECTION C: EHS IN PETROLEUM EXPLOITATION

*Answer at least **ONE** question from this section.*

5. (a) Figure 3 shows an oil structural trap. Study it and answer the questions that follow:

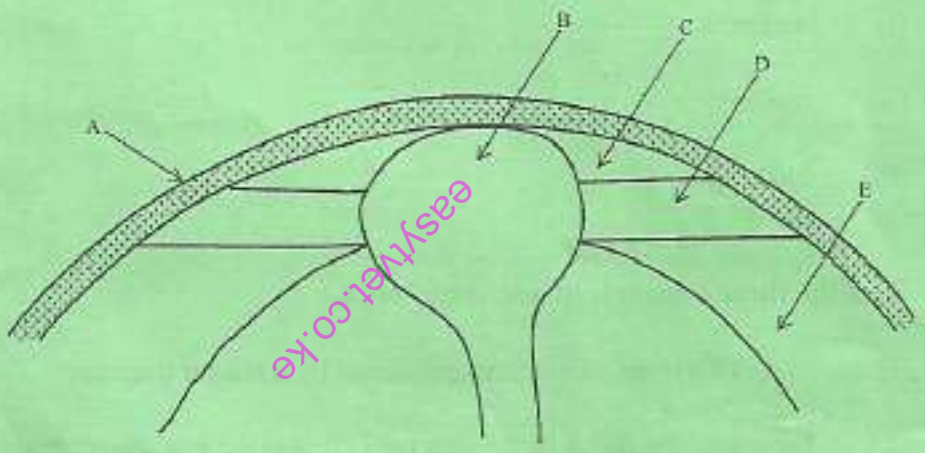

Fig. 3

(i) Name parts labelled A and B. (2 marks)

(ii) Identify products from parts C, D and E. (3 marks)

(iii) I Explain the secondary recovery process for extracting product D.
II List **three** tertiary recovery methods of extracting product D. (6 marks)

(b) (i) Name the stage at which the public is involved in an environmental Impact Assessment(EIA). (1 mark)

(iii) Explain the **four** ways of public involvement in an EIA. (8 marks)

6. (a) Give **two** measures undertaken to reduce hazards associated with oil underground storage tanks in relation to each of the following:

(i) Location; (2 marks)

(ii) Spill and overfill equipment (2 marks)

(iii) Vent pipes (2 marks)

(iv) Tank openings (2 marks)

(b) Outline **eight** measures undertaken during the implementation and monitoring stage of an environmental health and safety management system in a company. (8 marks)

(c) State **four** mitigation measures by the petroleum industry on untreated effluents rich in inorganic salts which are discharge into rivers. (4 marks)

SECTION D: LEGAL AND POLICY FRAMEWORK IN PETROLEUM EXPLORATION

*Answer at least **ONE** question from this section*

7. (a) State **eight** functions of the National Land Commission of Kenya as per the National Land Commission Act, 2012 (8 marks)

(b) Explain each of the following taxes levied by the Kenya Revenue Authority:

(i) Corporation Tax; (2 marks)

(ii) Pay As You Earn; (2 marks)

(iii) Value Added Tax. (2 marks)

(c) (i) (I) Explain Benefit-Cost ratio as used in cost-benefit analysis. (3 marks)

(II) Give the formula of Benefit-cost ratio. (1 mark)

(ii) Give **two** limitations of the benefit-cost ratio. (2 marks)

8. (a) State **four** distinctions between breach of contract and tort. (8 marks)

(b) The cost of production equations at two oil wells, A and B of a petroleum company are:

(A) $y = 40x + 200$

(B) $y = 15x + 500$

(i) Determine the point at which the cost of production is same for the two well sites. (3 marks)

(ii) Determine the cost of production for the two wells at

I $x = 6$

II $x = 20$ (4 marks)

(iii) Explain the site that would be suitable for high volume production. (2 marks)

(c) State **three** examples of properties that are classified under intellectual property. (3 marks)

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