1305/314
PLUMBING CRAFT THEORY
June/July 2012
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

PLUMBING CRAFT CERTIFICATE

PLUMBING CRAFT THEORY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

> *Answer booklet*
> *Drawing instruments*
> *Mathematical tables/Calculator*

*Answer any **FIVE** of the following **EIGHT** questions.*
All questions carry equal marks.
Maximum marks for each part of a question are as shown.

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.

Turn over

1. (a) Explain **four** classifications of fire stating a suitable extinguishing agent for each.

(6 marks)

(b) Fig. 1 shows details of a steel pipe fixed along a return angle masonry wall. Another steel pipe, 35 mm in diameter, is to be bent and jointed to the existing pipe using a union connection such that the distance from end of the pipe in union to the centre line after bending is 700 mm.

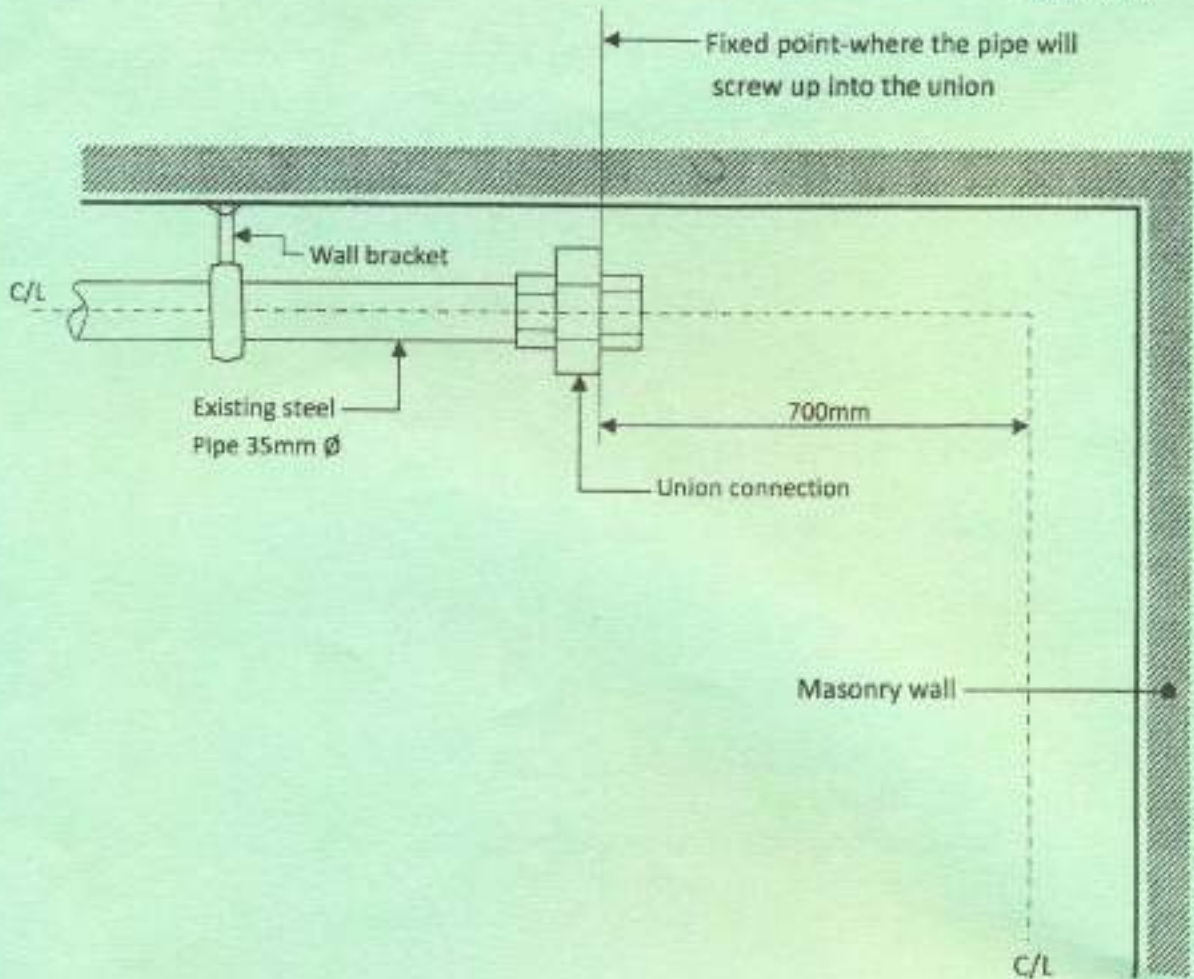Outline the procedure of making the 90° bend on the pipe using a hydraulic pipe bender.

(8 marks)

FIG 1

(c) (i) Explain furring in hot water systems and state three of its effects.

(ii) Sketch and label a typical water meter connection to a domestic water supply.

(6 marks)

2

2. (a) (i) state **six** safety precautions taken when using hacksaws.

   (ii) Sketch and label an adjustable frame hacksaw. (6 marks)

   (b) Assess the quality of water obtained from the following sources for drinking purposes.

   (i) Rain water
   (ii) Rivers and lakes
   (iii) Wells and boreholes. (6 marks)

   (c) Illustrate with labelled sketches, details of the following fixtures:

   (i) pillar tap
   (ii) gate valve. (8 marks)

3. (a) Classify the following into ferrous or non ferrous metals:

   - Copper   - Zinc
   - Pig iron   - Stainless steel
   - Lead   - Tin
   - Aluminium   - mild steel
   - Cast iron   - carbon steel

   (5 marks)

   (b) With the aid of a sketch, describe a wash down w.c. plan. (7 marks)

   (c) With the aid of a sketch, explain the operation of a solar water heating system. (8 marks)

4. (a) (i) Define the term "alloy".

   (ii) Describe the following alloys stating the metal composition of each:

   - Brass
   - Bronze

   (4½ marks)

   (b) (i) Write down Thomas Box formula for sizing pipes for hot and cold water installations and define all the terms.

   (ii) Calculate the diameter of a pipe to discharge 1.45 litres per second when the head is 5 m and the effective length is 36 metres. (6½ marks)

(c)   Sketch the layout plan for a separate system of drainage for the house and garage shown in fig. 2.   (5 marks)
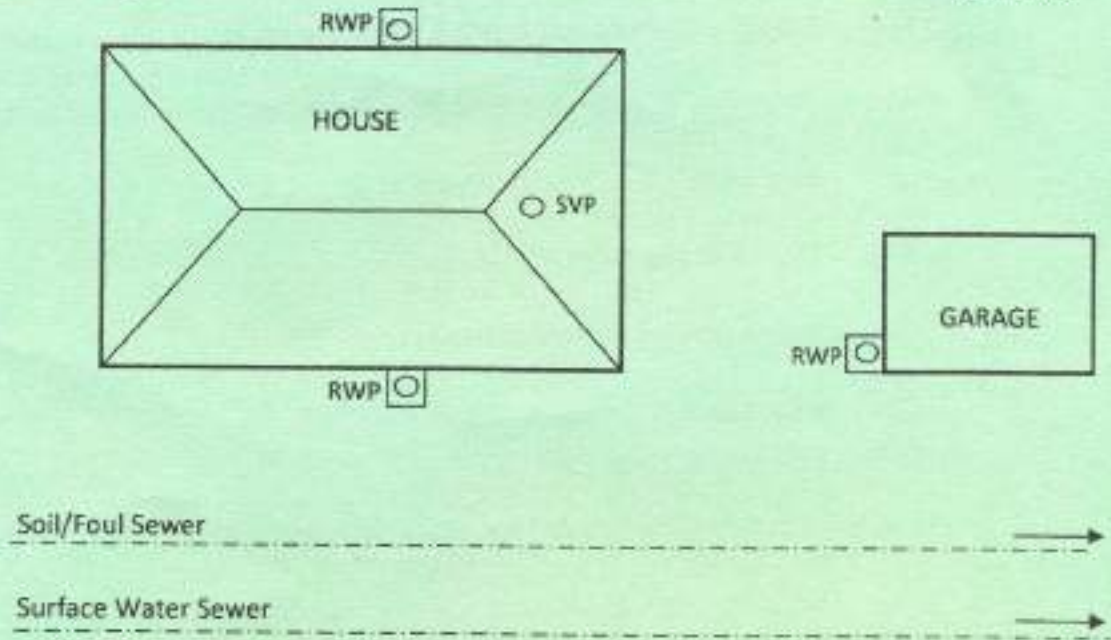

FIG 2

(d)   State **four** properties considered when selecting insulating materials for hot water systems.   (4 marks)

5.   (a)   (i)   Distinguish between gas welding and welding:

(ii)   Explain the following types of braze welding

I   Bronze brazing;
II   Silver brazing.   (6 marks)

(b)   Describe the following weld defects in arc welding and state two causes of each
(i)   Under-cut
(ii)   Spatter
(iii) Porosity   (6 marks)

(c)   Sketch and label the main features of a single stack system.   (8 marks)

6.   (a)   (i)   List **four** materials used for making rain water gutters.

(ii)   State **three** problems that can prevent rain water gutters from functioning properly.   (3½ marks)

(b) (i) Write down the specific heat capacity equation and define all the terms.

   (ii) Calculate the amount of heat required to raise the temperature of 250 litres of water from 20° C to 100 ºC.
   Take specific heat capacity of water = 4.18 Kj.   (4 marks)

(c) Sketch and label the following types of joints:

   (i) Manipulative joint in copper pipes.
   (ii) Flexible 'O' ring joint in clay pipes
   (iii) Saddle connection to sewers.   (8½ marks)

(d) With the aid of a sketch, explain the operation of a ball float steam trap.   (4 marks)

7. (a) Explain the following in cold water supply:

   (i) Water - hammer
   (ii) Back - siphonage
   (iii) Hydro - preumatic accumulator.   (4½ marks)

(b) (i) State **six** factors considered when designing rain water goods.

   (ii) A 300 mm diameter UPVC sewer running at half bore at a velocity of 1.526 m/s is to be installed. Using the Chezy formula, calculate the minimum gradient for the sewer.
   Take Chezy constant = 55

                                                                                      (6½ marks)

(c) (i) With the aid of a sketch, describe the working principle of a fusible soldered strut head type of a sprinkler system.

   (ii) With the aid of a sketch, describe the wet pipe sprinkler installations system.
                                                                                      (9 marks)

8. (a) (i) State **six** factors observed when installing gas pipe work.

   (ii) With the aid of a sketch, outline the procedure for soundness test in newly installed gas pipe work.
                                                                                      (8 marks)

(b) Outline **five** design requirements for above ground drainage in multi-storey buildings.
                                                                                      (5 marks)

(c)   Table 1 shows appliances to be installed in a domestic house. Prepare a costing schedule for the appliances.

(7 marks)

Item No	Appliance Description	No of Appliances	Unit Cost (Ksh)
1	W.C. and Cistern	1	3,800
2	Bath Tub	1	8,200
3	Kitchen Sink	1	2,400
4	Wash Hand Basin	1	2,000
TOTAL COST			16,400

Allowance Percentages

-     Labour @10% cost of appliance
-     Overheads @5% cost of appliance
-     Profits @20% cost of appliance