DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

University Examination 2021/2022

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING, BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING, BACHELOR OF SCIENCE IN LEATHER TECHNOLOGY AND BACHELOR OF EDUCATION TECHNOLOGY IN MECHANICAL ENGINEERING

EMG 1102/SLT 2102 ENGINEERING DRAWING AND DESIGN

**DATE: 24//1/ 2022**   **3 HOURS**   **TIME: 8.30AM**

INSTRUCTIONS

(a) This paper contains **FIVE** (5) questions.

(b) You are required to answer **THREE** (3) questions only.

(c) Question **ONE** is compulsory.

(d) Attempt any other **TWO** questions.

(e) Construction lines should be faint and should not be erased.

(f) All dimensions are in millimeters unless otherwise stated.

(g) Accuracy, neatness and good line-work are essential.

(h) Missing and mismatching dimensions, if any, may be suitably assumed

QUESTION ONE (COMPULSORY) (30 MARKS)

(a) **Fig. Q 1(a)** is an isometric/pictorial representation of an engine bracket. The key dimensions of the various features of the part are indicated on the figure. In first angle orthographic projection, draw (to scale) the following views of the part including the key dimensions.

    (i) Front elevation   **(6 Marks)**

    (ii) Plan   **(5 Marks)**

    (iii) End/Side view   **(4 Marks)**

    (iv) Standard first angle projection symbol   **(2 Marks)**

    (v) A title block   **(3 Marks)**
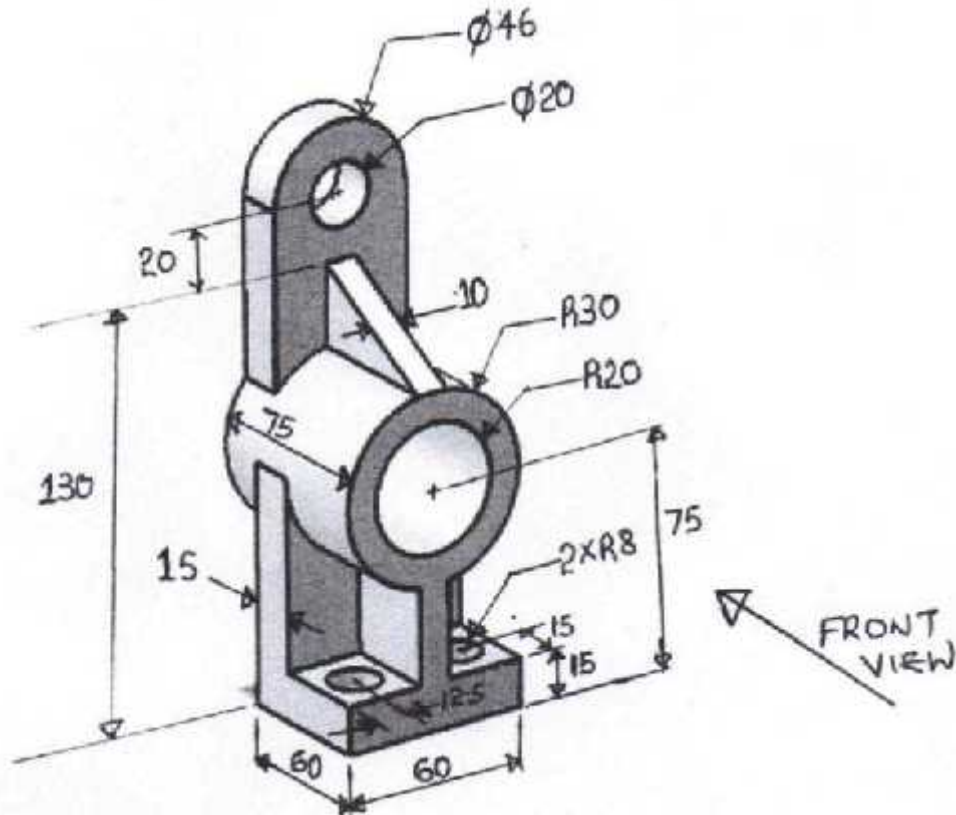
Fig. Q 1(a)

(b) The views shown in **Fig. Q 1(b)** are represented in 3rd angle orthographic projection. Draw (to scale) the isometric projection of the views.   **(10 Marks)**
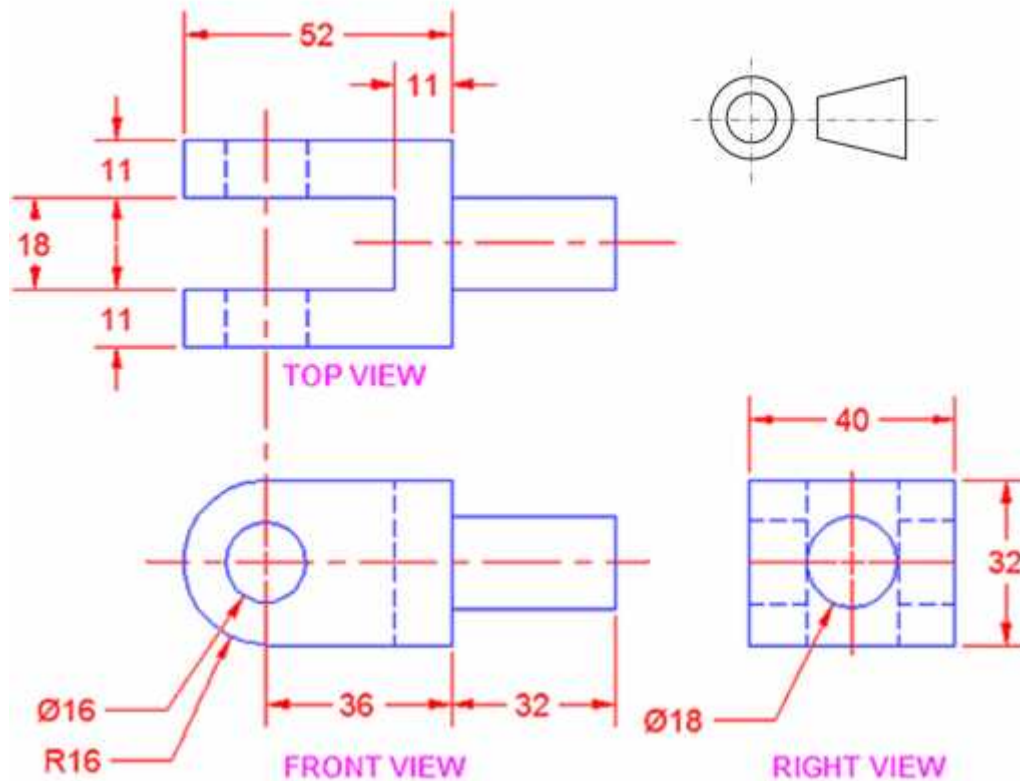
Fig. Q 1(b)

QUESTION TWO (20 MARKS)

A cam, with a minimum radius of 26 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below:

1. To raise the valve through 60 mm during 180° rotation of the cam,
2. To keep the valve fully raised through next 60°;
3. To lower the valve during next 120°; and

The diameter of the roller is 12 mm and the diameter of the cam shaft is 20 mm. The displacement of the valve, while being raised and lowered, is to take place with uniform acceleration and retardation and simple harmonic motion respectively.

(a) Draw the displacement diagram for one complete revolution of the cam.   **(10 marks)**
(b) Draw the profile of the cam when the line of the stroke passes through the axis of the cam shaft.   **(10 marks)**

QUESTION THREE (20 MARKS)

Fig Q 3 shows the primary views of the components of a tension pulley assembly. The complete list of parts is as follows

ITEM	DESCRIPTION	QUANTITY
1	Mounting frame	1
2	Wheel	1
3	Bush	1
4	Collar	1
5	Collar	1
6	Shaft	1
7	Washer	1
8	M18 hexagonal nut (not shown)	1

a) Draw, as an assembly drawing to scale 1:1, a half-sectional front view of the assembly with the top half in section. No hidden detail is necessary. **(18 marks)**
b) Insert a suitable title and scale centrally below the drawing. **(2 marks)**
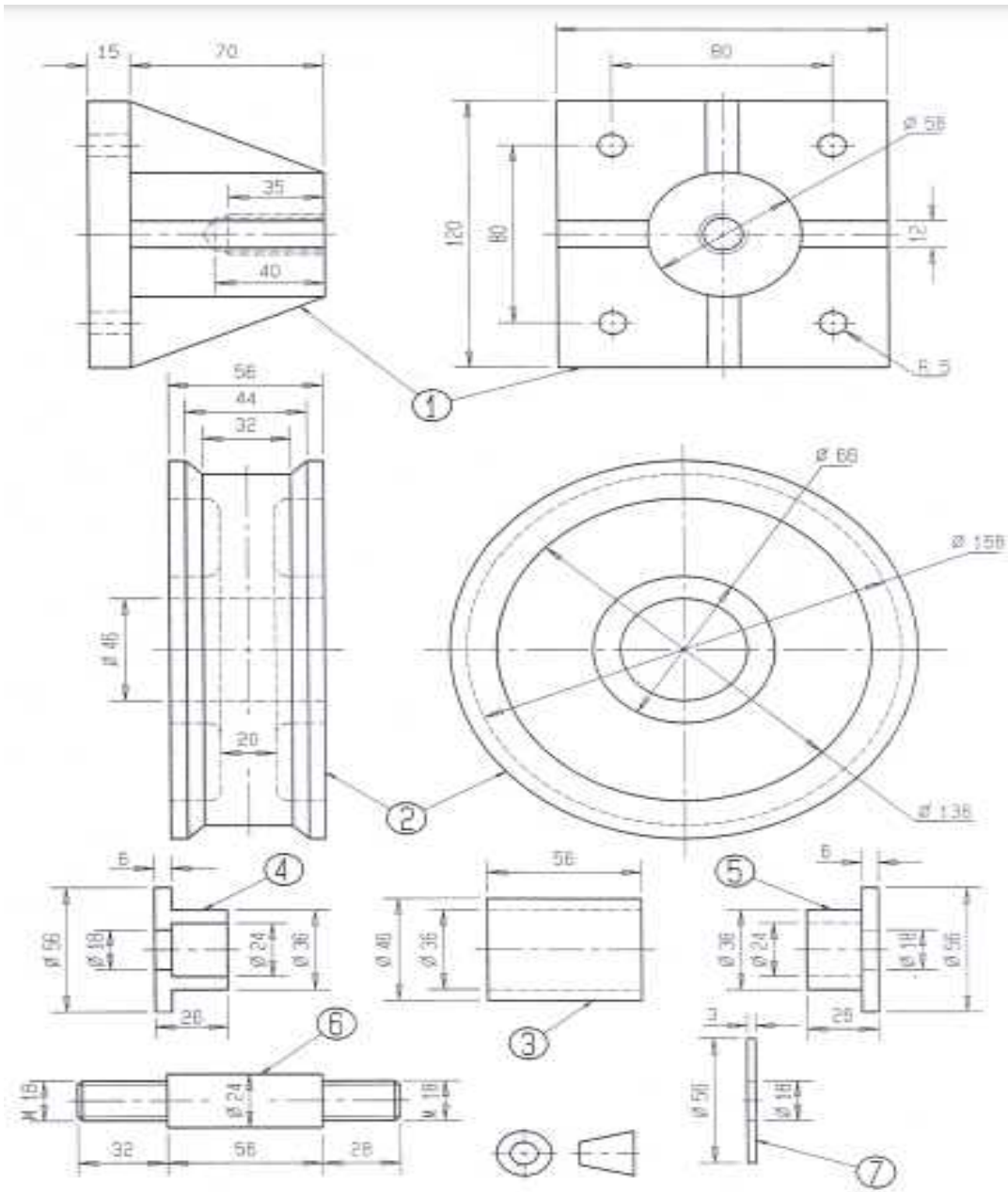
Fig Q 3

QUESTION FOUR (20 MARKS)

a) Draw locus of a point P, 6 mm **away** from the periphery of a circle which rolls on straight line path. Take Circle diameter as 60 mm. Identify the locus constructed.   **(8 Marks)**

b) Fig **Q 4 (b)** shows a slider crank mechanism. Plot the locus of point C for one complete revolution of the crank OA.   **(12 marks)**
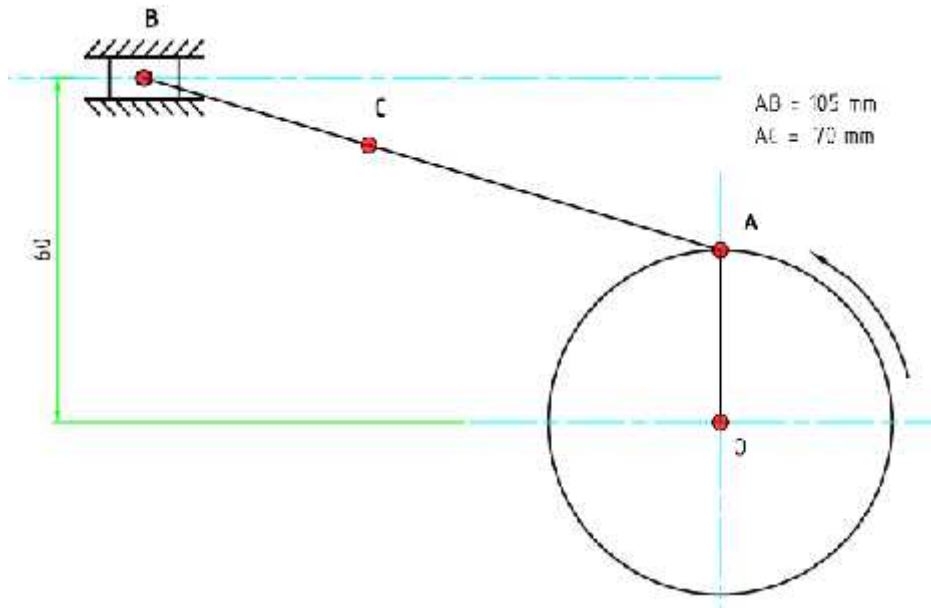
Fig Q 4 (b)

QUESTION FIVE (20 MARKS)

(a). **Fig Q5 (a)** shows a scale layout of a piping system. Make a schematic drawing of the piping system in symbol using a suitable scale. Details which are not standard symbols should be made in outline and noted. **(8 Marks)**
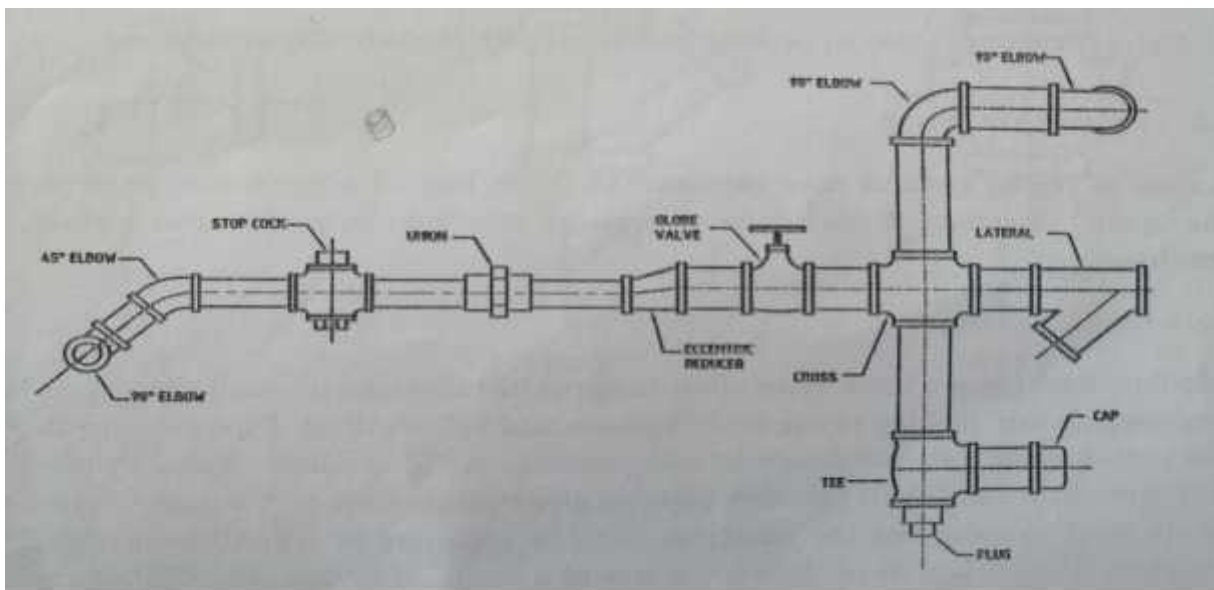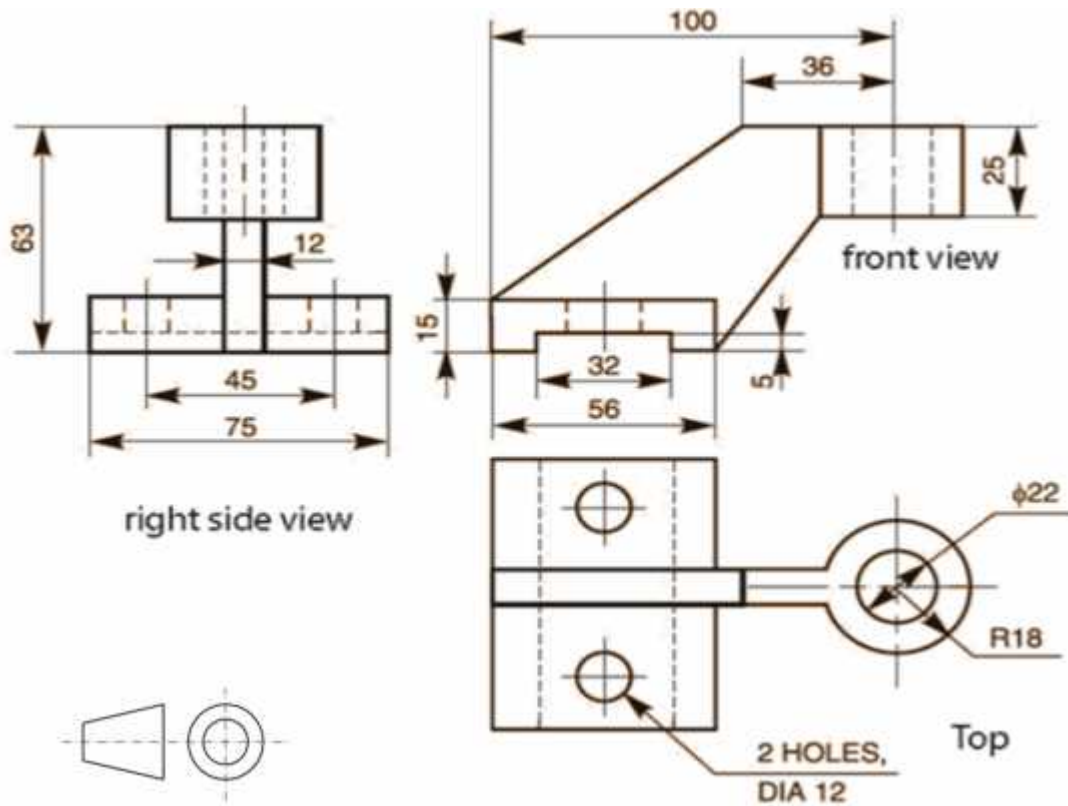

Fig. Q5(a)

(b) Draw symbols of the following electrical and electronic items according to BS 5070 and BS 3939 and state their uses;

      (i)   Dual on-off switch **(1 Mark)**

(ii) Relay **(1 Mark)**
(iii)Trimmer Capacitor **(1 Mark)**
(iv)Photodiode **(1 Mark)**
(v) Phototransistor **(1 Mark)**

(c) The orthographic views in **Fig. Q 5 (c)** are given in the first angle projection. Sketch (*not to scale but in approximate dimensional proportions*) the isometric/pictorial projection of these views. **(7 Marks)**

Fig. Q 5 (c)