

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA

MATRICULATION EXAMINATION
ADVANCED LEVEL
SEPTEMBER 2014

SUBJECT:	ENGINEERING DRAWING/GRAPHICAL COMMUNICATION
PAPER NUMBER:	I
DATE:	2 nd September 2014
TIME:	9.00 a.m. to 12.00 noon

Directions to Candidates

Write your index number where indicated at the top of all drawing sheets.

Attempt **any five** questions.

Programmable calculators **cannot** be used.

Unless otherwise stated:

- a. drawings should conform to B.S. or equivalent (ISO) standards;
- b. all dimensions are in millimetres;
- c. all answers are to be accurately drawn with instruments;
- d. unless otherwise stated, all construction lines must be left in each solution;
- e. drawing aids may be used.

Dimensions not given should be estimated.

Careful layout and presentation are important.

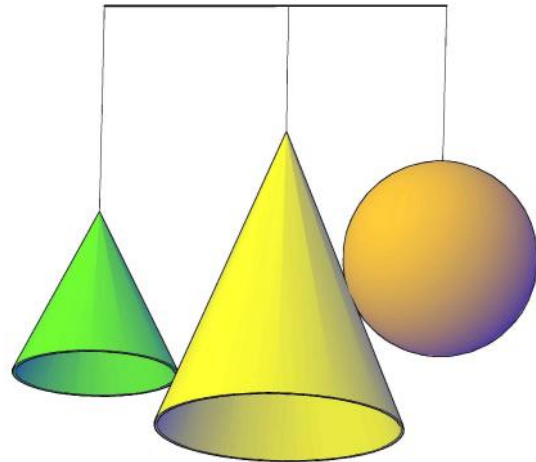
Marks will be awarded for accuracy, clarity and appropriateness of constructions.

Question 1

A design of a hanging light is illustrated. The two unequal right cones and the sphere are in mutual contact with each other to form the desired arrangement of the hanging light.

Copy, full size;

- a) the auxiliary elevation of the required sphere, with P as the point of contact of the sphere with the cone. Show how the centre of the sphere is obtained,
- b) by projection obtain the position of the centre and the point of contact of:
 - i) P on the plan, representing the required projections of the sphere and the cone,
 - ii) Q on the plan, representing the required projections of the two cones,
- c) determine the position of the points of contact P and Q by projection on the front elevation.



(20 marks)

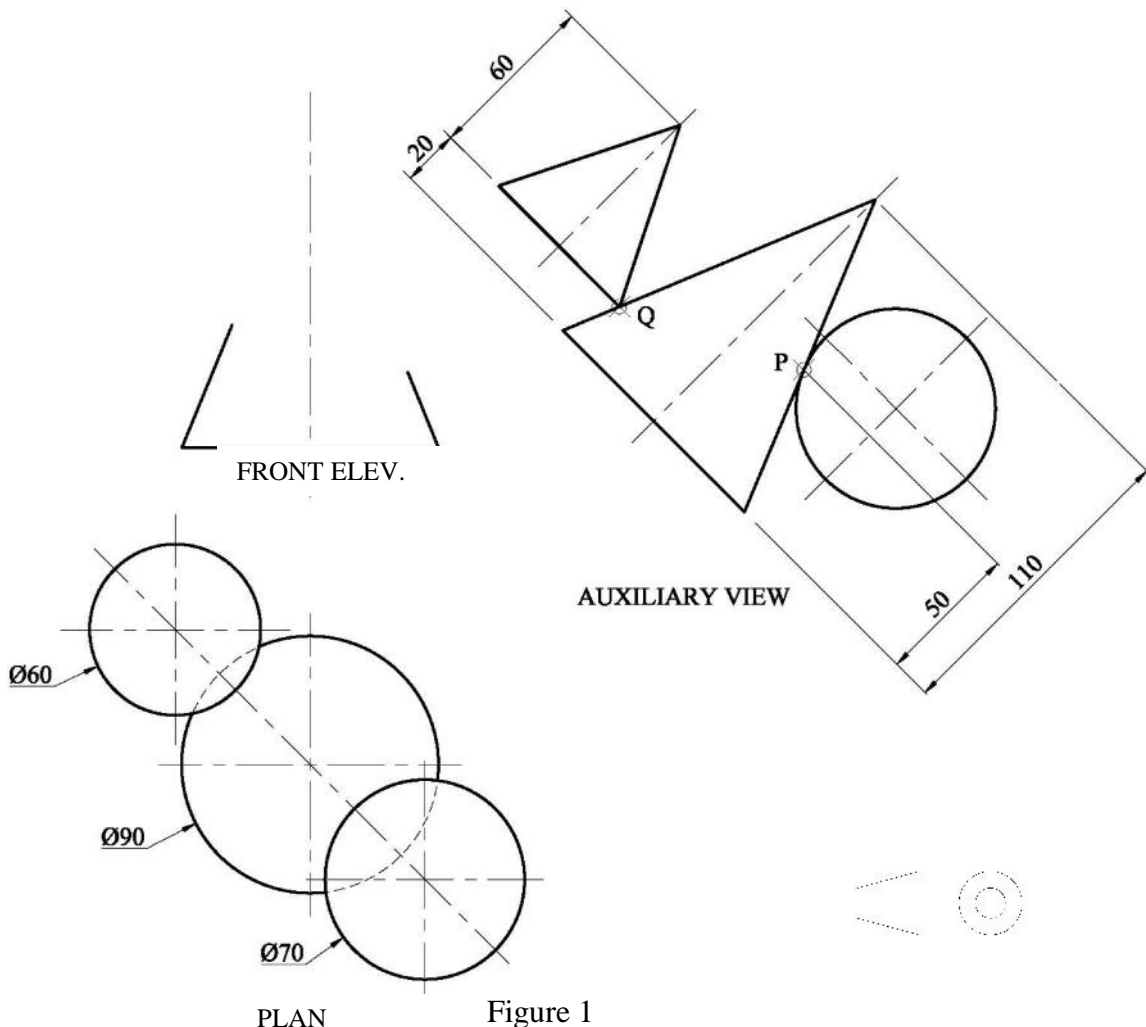
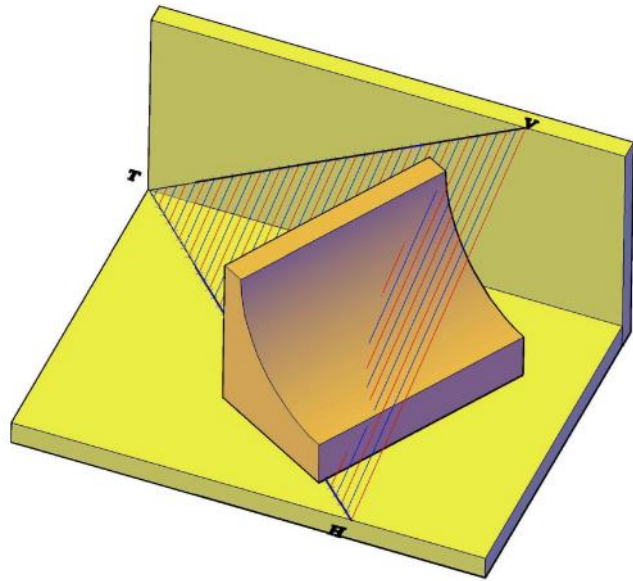


Figure 1

Question 2

A cross section of a moulding is shown in Figure 2. The moulding is resting on the horizontal plane with its side inclined at 60° to the vertical plane as shown in the plan. The position of the traces and their apparent angles are also included.

- a) Draw an auxiliary elevation showing the oblique plane as an inclined plane. Include in this elevation the moulding, showing how the section is passing through the moulding.
- b) Show on the given plan the section of the moulding which lies below the oblique plane.
- c) Draw a true shape of the section of the moulding.



(20 marks)

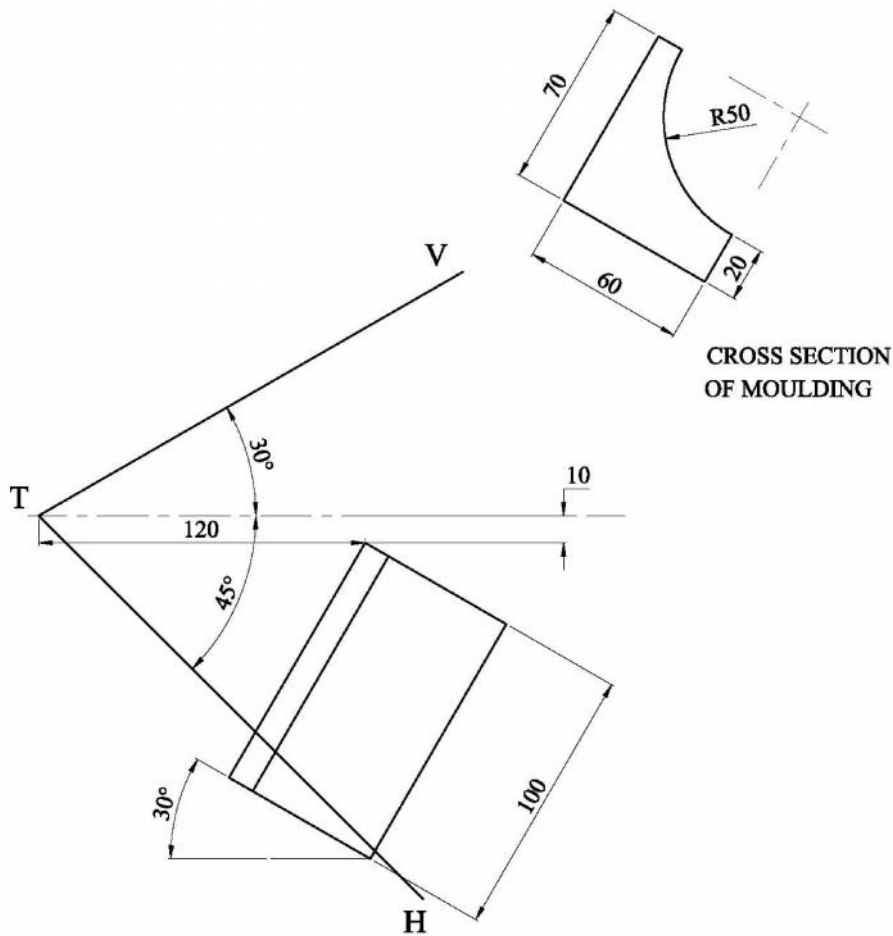


Figure 2

Question 3

The loaded beam shown in Figure 3 carries a uniformly distributed load and two point loads one of which at its overhanging end.

- a) Copy the space diagram using a scale of 10mm representing 0.5m.
- b) Using a scale of 10mm representing 0.5kN, draw the vector diagram and a polar diagram using a polar distance of 120mm.
- c) Draw the shear force and bending moment diagrams for the loaded beam shown,
- d) Determine graphically:
 - i) the magnitude of the left and right reactions;
 - ii) the position and magnitude of the greatest bending moment.

(20 marks)

SPACE DIAGRAM

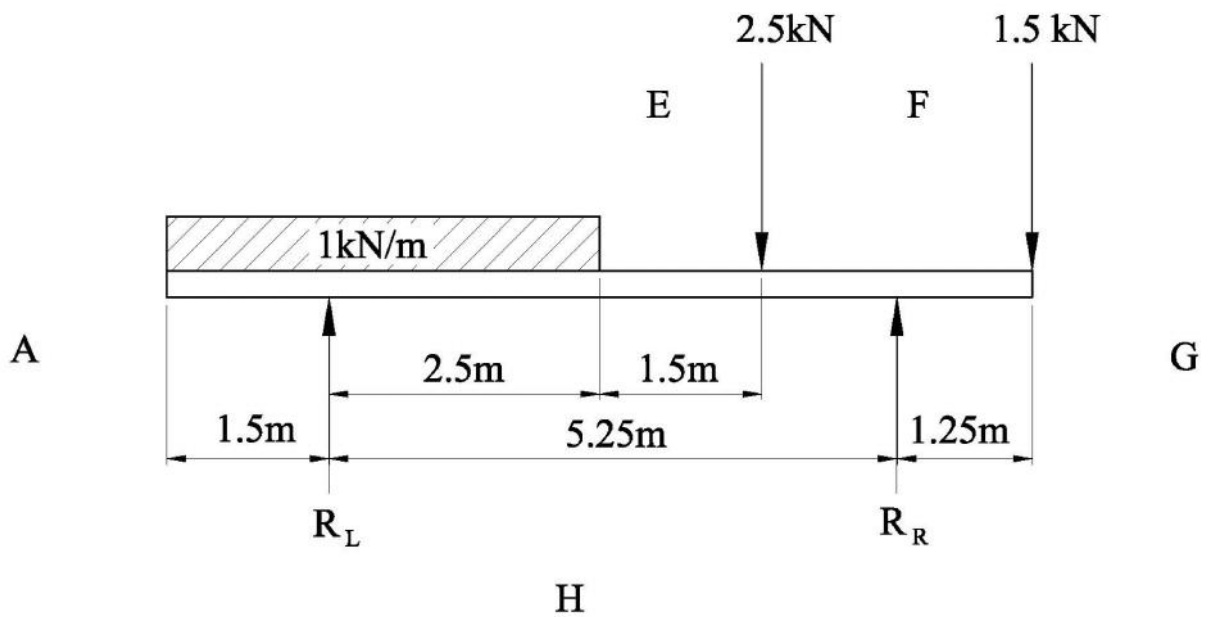


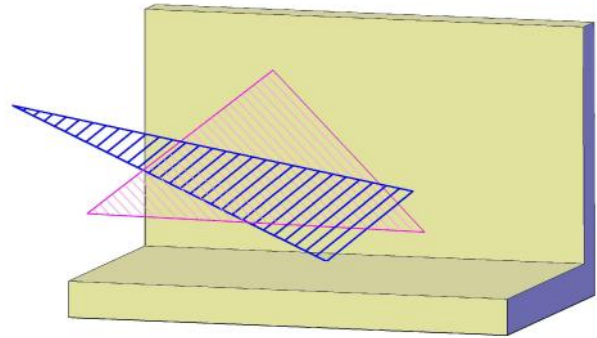
Figure 3

Question 4

Incomplete orthographic projections of two intersecting triangles are shown in Figure 4.

To a scale of 1:1:

- Copy the given views
- Construct a first auxiliary view of the two triangles, showing the triangular lamina ABC as a straight line in this view
- Draw a complete front elevation and plan showing clearly the intersecting line between the two triangles
- Construct the true shape of the triangular lamina ABC by drawing a second auxiliary view.



(20 marks)

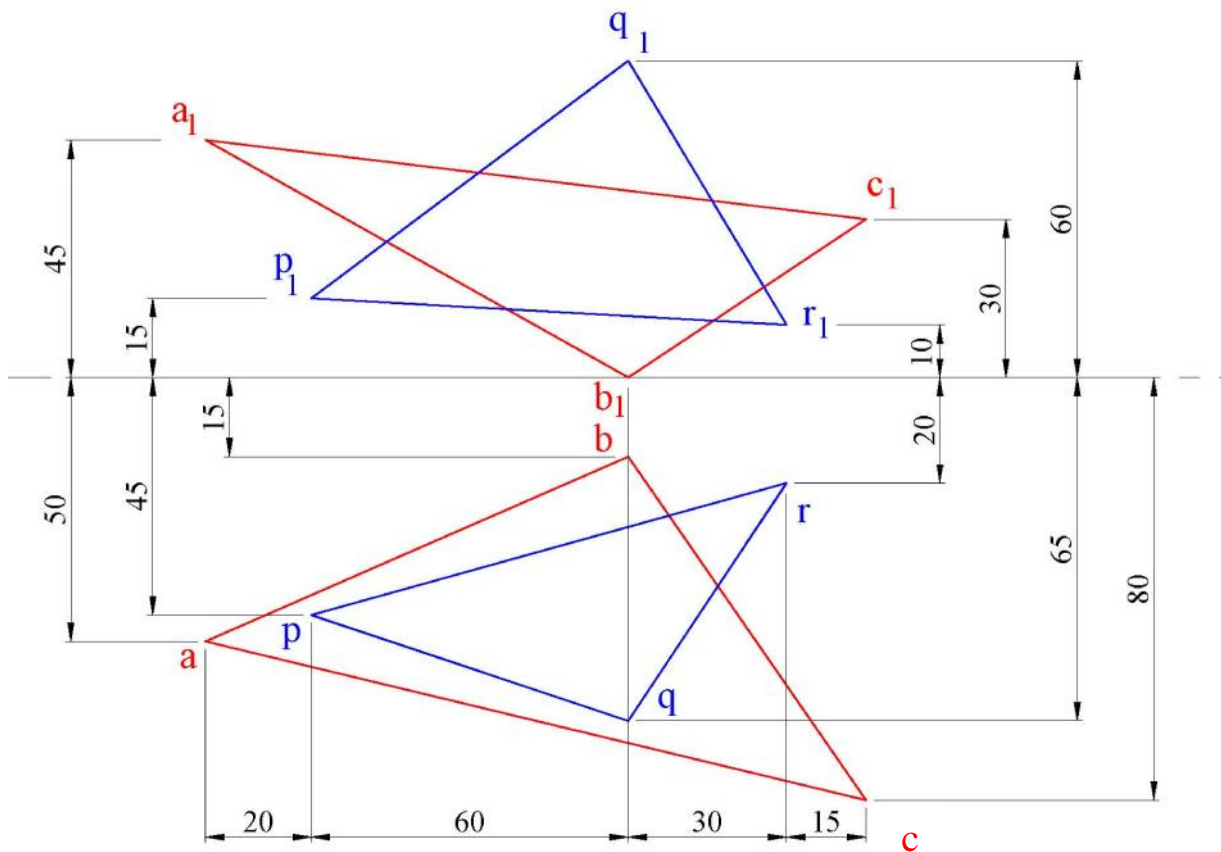


Figure 4

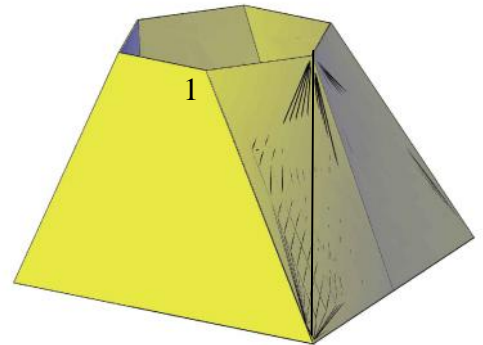
Question 5

A ventilation duct, which is manufactured from sheet metal, is shown in Figure 5. The duct is used for ventilation in a workshop.

Construct, to a scale of 1:1:

- a) the given views;
- b) the necessary true lengths to construct the development of the surface of this duct before bending. The joint line is to be made along A-1. Ignore material thickness.

(20 marks)



A

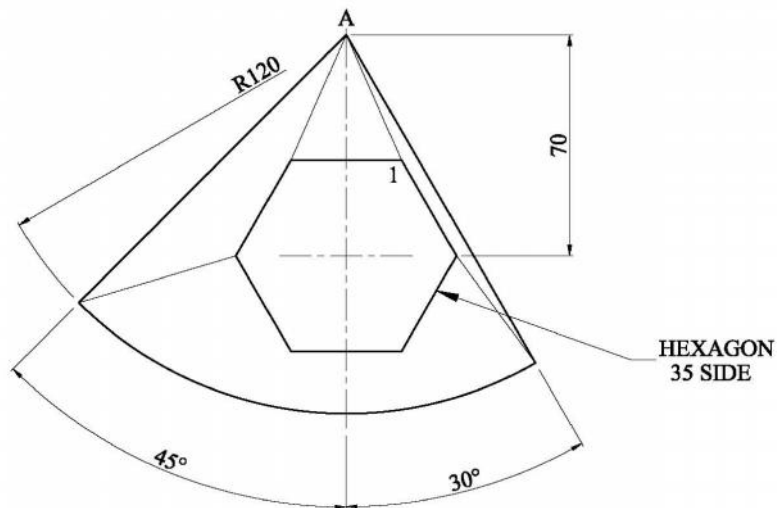
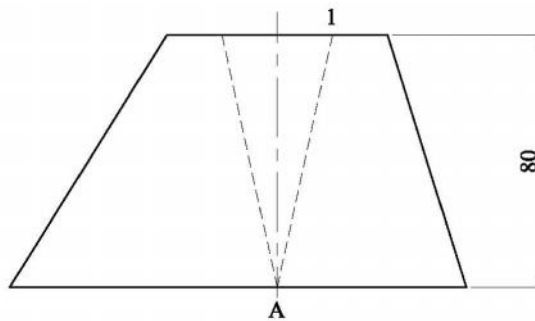


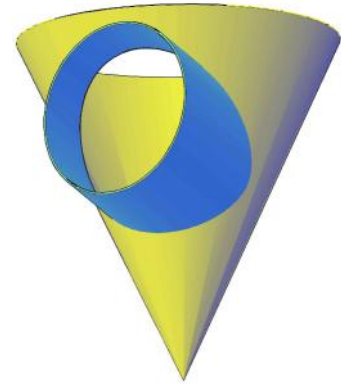
Figure 5

Question 6

A horizontal right cylinder is 70 mm diameter and penetrates an inverted right cone as shown in Figure 6.

- Draw, full size, the given views.
- Obtain the curves of intersection on the plan.
- Project the points of intersection from the plan to the front elevation and join by a smooth continuous curve to complete the view.

Include hidden detail.



(20 marks)

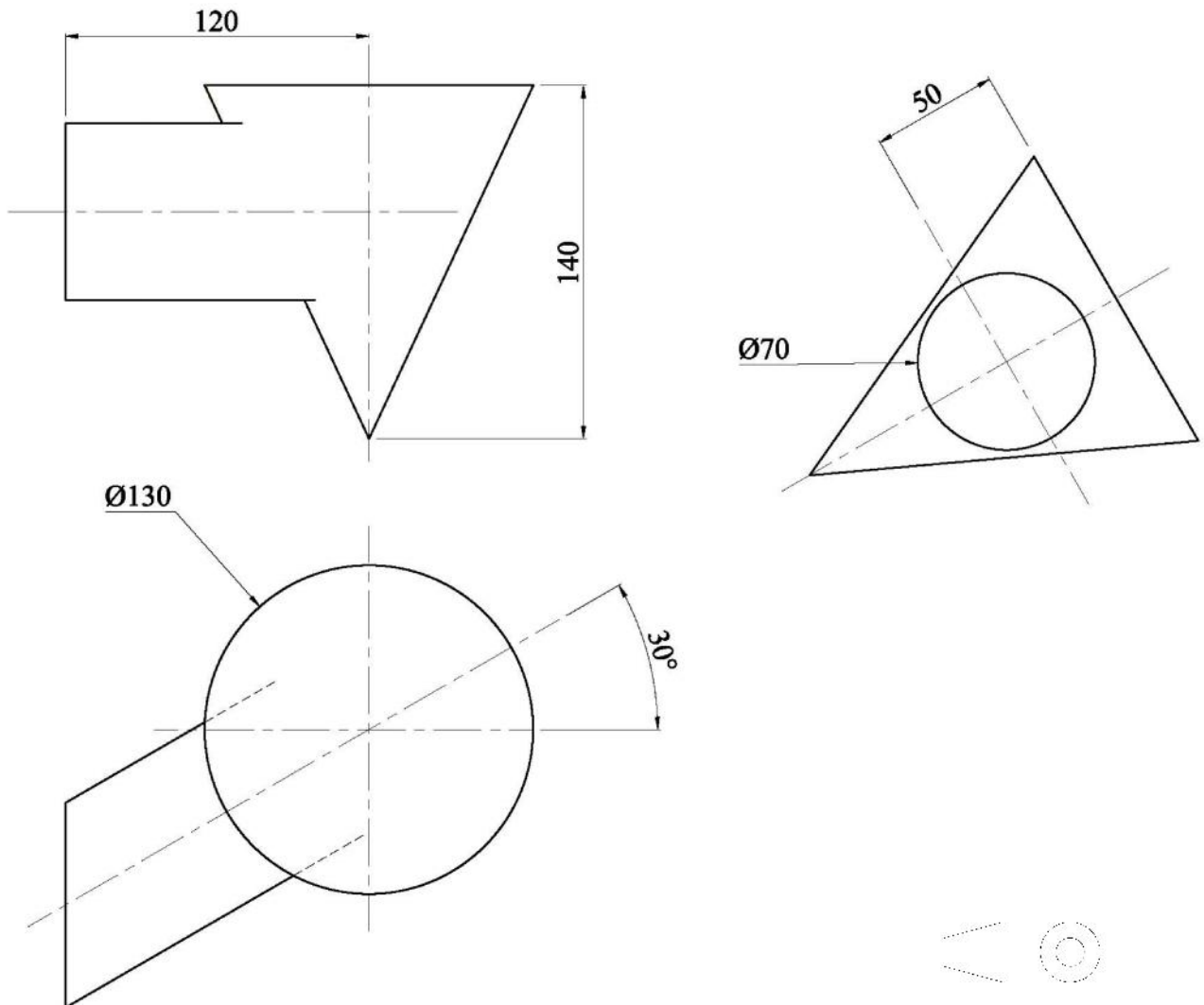


Figure 6

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

MATRICULATION EXAMINATION
ADVANCED LEVEL
SEPTEMBER 2014

SUBJECT:	ENGINEERING DRAWING
PAPER NUMBER:	II
DATE:	3 rd September 2014
TIME:	9.00 a.m. to 12.00 noon

Directions to Candidates

Write your index number where indicated at the top of all drawing sheets.

Attempt **question 1** and any other **two** questions.

Programmable calculators **cannot** be used.

Unless otherwise stated:

- a. drawings should conform to B.S. or equivalent (ISO) standards;
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- c. all answers are to be accurately drawn with instruments;
- d. all construction lines must be left on each solution;
- e. drawing aids may be used.

Dimensions not given should be estimated.

Careful layout and presentation are important.

Marks will be awarded for accuracy, clarity and appropriateness of constructions.

Mark allocations are shown in brackets.

Question 1 carries 60 marks. Questions 2, 3 and 4 carry 20 marks each.

Question 1

An illustration of a friction clutch is shown in Figure 1.
The details of the clutch are shown in Figures 1a and 1b.

Assembly

The key (item 2) is seated in the 30 x 10 x 4 mm deep slot of the shaft (item 3). The shaft together with the key is fitted into the 36mm diameter shaft bore of the external conical piece (item 1). The shaft is aligned in position by means of the key engaging in the 10mm wide slot of the external conical piece, until the 36mm diameter end of the shaft makes contact with surface 'P'. The 70 x 10 x 8mm key (item 5) is seated in the 4mm deep slot of the shaft (item 6). This sub-assembly fits in the 36mm bore of the internal conical piece (item 4). The 36mm diameter end of the shaft is to make contact with surface 'Q'. The 7mm diameter end of the pin (item 7) is pressed into the 7mm diameter hole of the pressure ring (item 8) on the 15 mm diameter face. The other pin is assembled in the same manner on the other half of the pressure ring. The two pressure rings are positioned into the 15mm wide recess of the internal conical piece. The two semi-circular shaped pressure rings are held securely in position by means of the forked lever (item 9), with the semi-circular tongued ends fitted on the 10mm diameter portion of the pins. The complete assembly is fitted into the tapered conical surface of the external conical piece, until the conical surface 'M' is in contact with the conical surface 'N' of the external conical piece.

Draw, full size, the following views of the assembled clutch and shaft portions. Use either first or third angle projection.

- a) A sectional longitudinal front elevation, taken on the shaft axis, with the clutch in engaged position and the fork lever upright.
- b)
 - i) A half sectional elevation taken through the vertical centre-line of the forked lever in view (a) and seen looking from the left.
 - ii) A half outside elevation of the assembly as seen from the left.

State or draw the symbol of the method of projection used.

Hidden detail must not be indicated on your drawing.

(60 marks total)

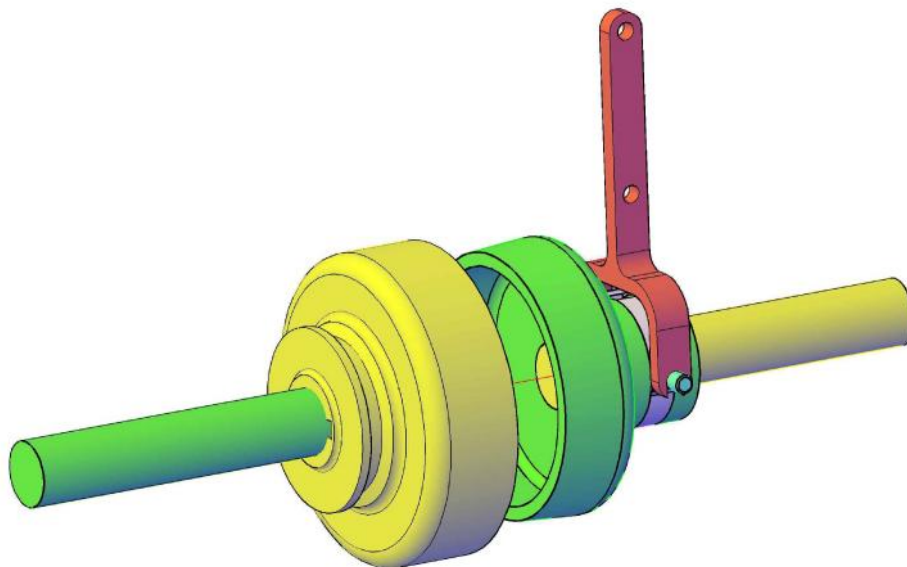


Figure 1

Question 2

An in-line gravity fall non-return valve for use in gas pipes is to be fitted to the two-flanged pipes shown in Figure 2.

Draw neatly, in proportion, a sectional elevation of a suitable design of a flap valve, which can be securely bolted to the two flanged pipes shown.

The flap valve is to be pivoted at the top edge and closes the pipe if an explosion blow-back ignites the gas beyond the valve. The flap is opened by the flow of gas.

What is the best material for the sealing face lining?

(20 marks total)

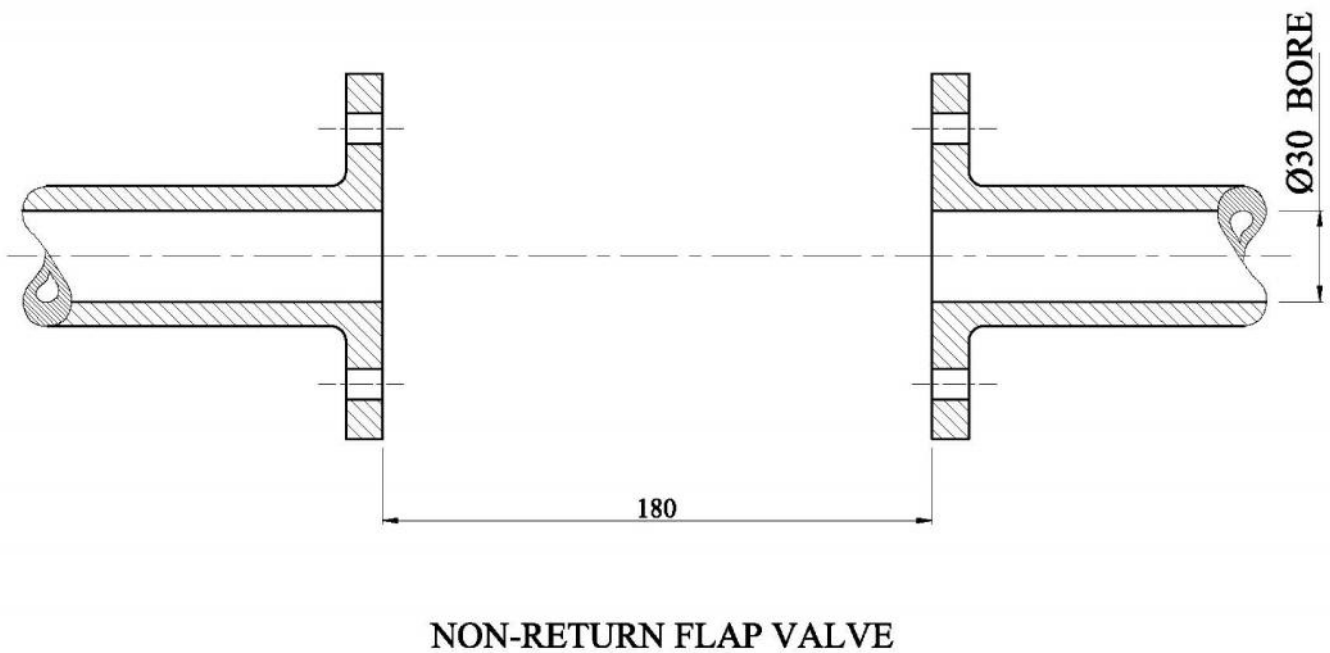


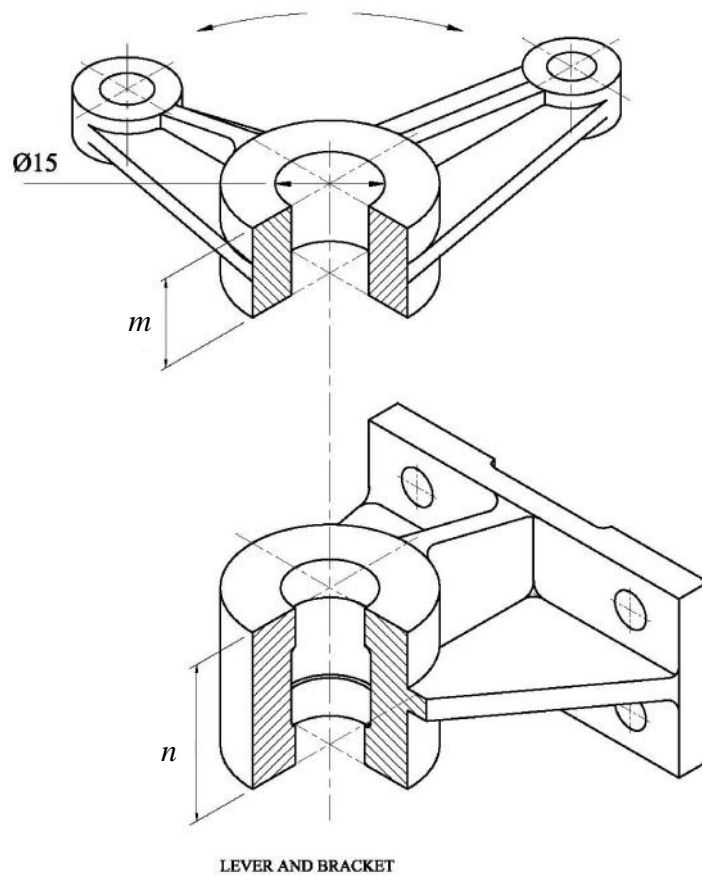
Figure 2

Question 3

The mechanism shown in Figure 3 consists of a lever and a bracket. The lever is to be located on the bracket by means of a special bolt secured by a washer and a hexagonal nut. The bolt is to have a clearance fit in the lever. The bolt has a fit in the lever designated by H 8 – f 7.

- a) What are the values of the maximum and minimum clearances for the fit of the bolt shank?
- b) What are the limits of size for the lever hole?
- c) Draw, to a suitable scale, an elevation and a plan of the bolt, washer and nut. Include proper dimensions on this elevation. Estimate the dimensions 'm' and 'n'.

(20 marks total)



LIMITS OF TOLERANCE					
NOMINAL SIZE		H 8		f 7	
Over	Up to	Upper	Lower	Upper	Lower
6	10	+22	0	-13	-28
10	18	+27	0	-16	-34
18	30	+33	0	-20	-41

Figure 3

Question 4

A coupling is a type of joint, which is capable of transmitting power by torsion.

- a) Mention at least four types of couplings.
- b) Two 50mm diameter shafts are slightly out of alignment.

Produce a sectional elevation of a suitable coupling for these two shafts.

Assume that the coupling is to be secured by six hexagonal bolts bolted to the flanges keyed to the shafts. Show in this elevation how this irregularity of transmission is absorbed and eliminated.

(20 marks)

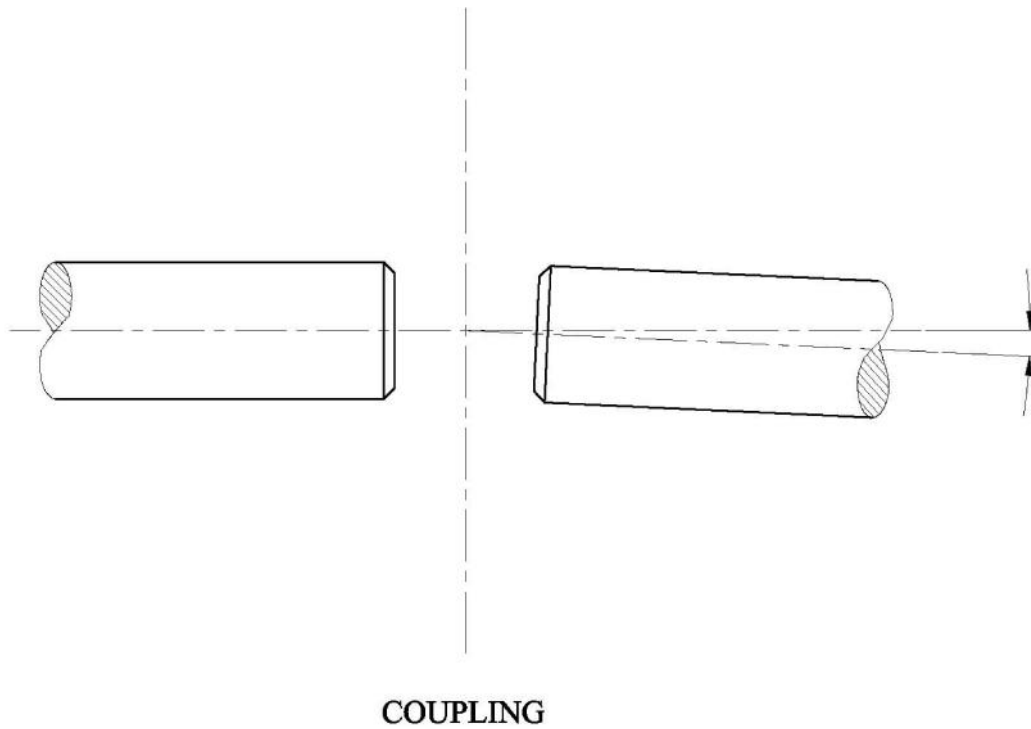
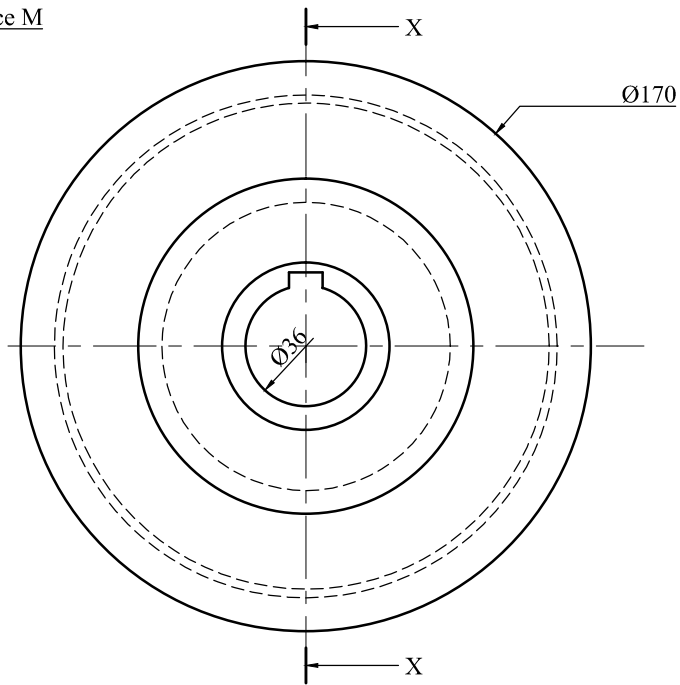
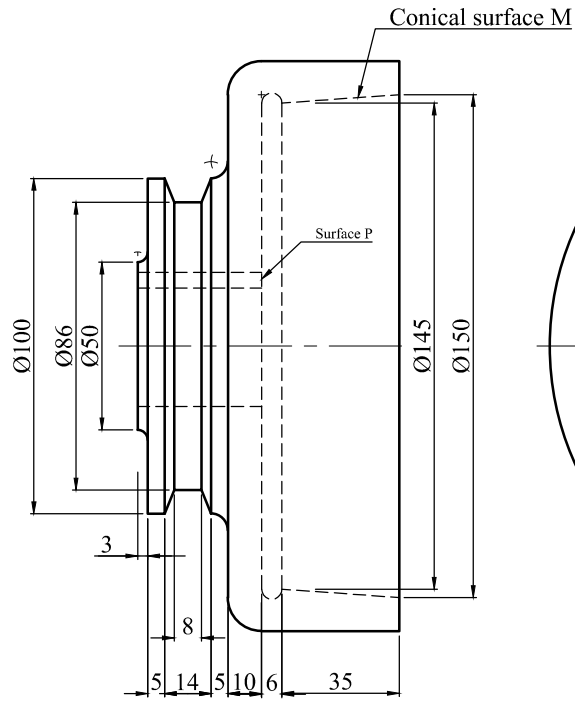
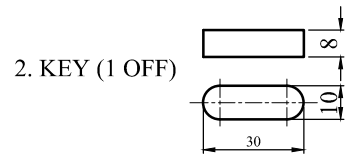


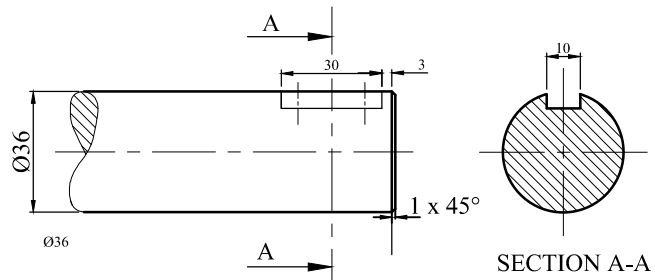
Figure 4



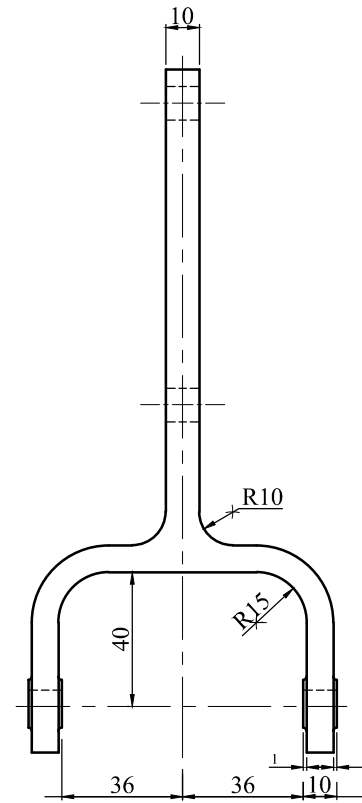
1. EXTERNAL CONICAL PIECE (1 OFF)



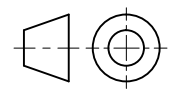
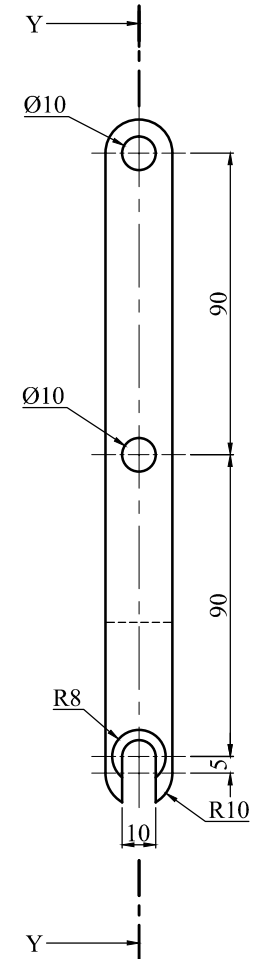
2. KEY (1 OFF)



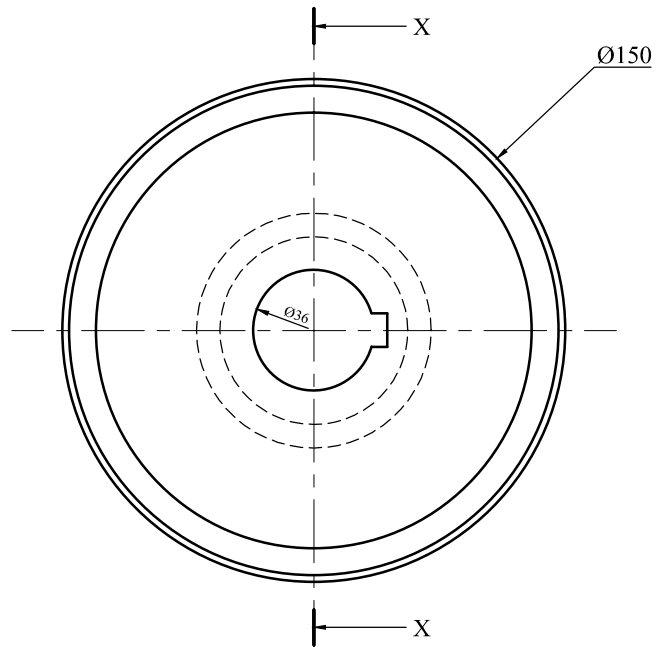
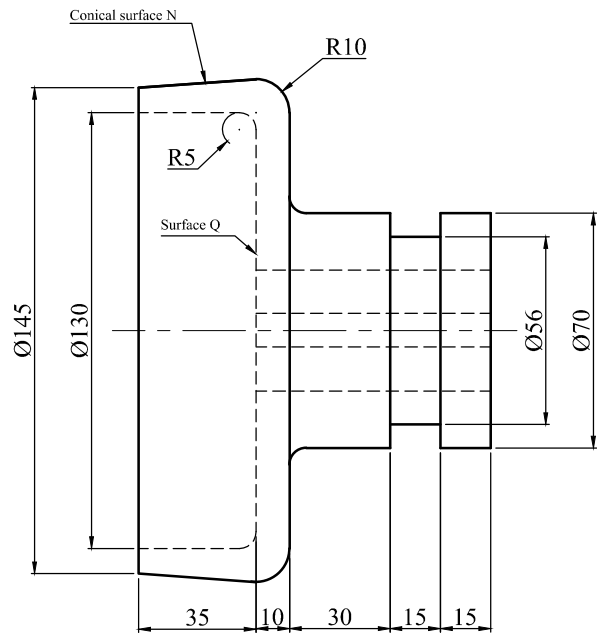
3. SHAFT (1 OFF)



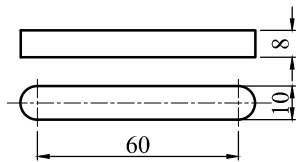
9. CLUTCH FORKED LEVER (1 OFF)



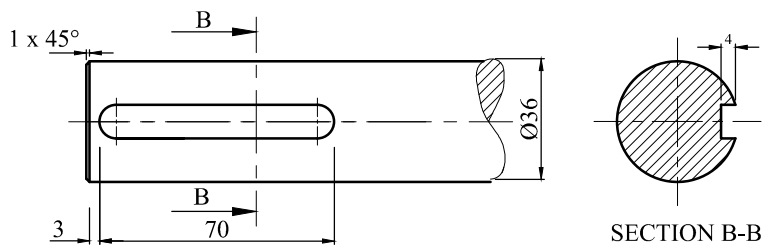
CONICAL FRICTION CLUTCH (Figure 1a)



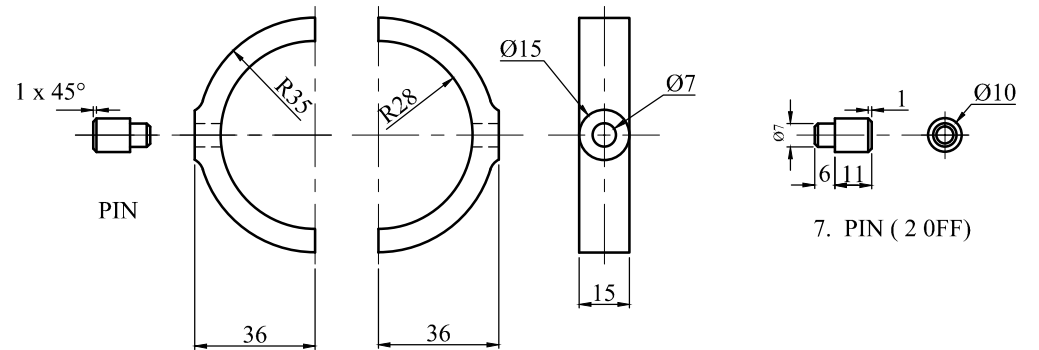
4. INTERNAL CONICAL PIECE (1 OFF)



5. KEY (1 OFF)



6. SHAFT (1 OFF)



8. PRESSURE RING (1 OFF)

CONICAL FRICTION CLUTCH (Figure 1b)

