For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

TECHNICAL GRAPHICS AND DESIGN **6047/2**
PAPER 2 Mechanical and Building Drawing

SPECIMEN PAPER 3 hours 10 minutes

Additional materials:
A2 Drawing paper (2 sheets)

TIME 3 hours 10 minutes

INSTRUCTIONS TO CANDIDATES

Print your name, Centre number and candidate number at the bottom right-hand corner of your answer sheet.

You should spend the first **ten** minutes reading the whole question paper before attempting the questions.

There are **two** questions from building drawing and **two** questions from mechanical drawing. Answer **any one** question on the separate drawing paper provided.

Short concise notes and small auxiliary sketches may be presented to clarify any design features.

Measurements **not** given are left to your own discretion. Work out all your answers in **SI** units.

If you use more than one sheet of paper, fasten the sheets together.

INFORMATION FOR CANDIDATES

Marks are given in brackets [ ] at the end of each question or part question.
The diagrams are **not** necessarily drawn to scale.
All dimensions are in **millimetres** unless otherwise stated.
You are reminded of the need for good English and clear presentation in your answers.

This question paper consists of 11 printed pages, 1 blank page.

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Question 1

The components of a **Safety Valve** are shown in **third angle** projection.

Method of Assembly

Valve (5) is slid into the **valve seat (6)** from the flange side. The sub-assembly is inserted into the **body** (**1)** such that the valve seat flange is in contact with the body. The **valve stem (9)** is lowered into the body until the rounded end sits on the valve.

Next, the **packing (8)** is inserted into the **cover (2).** The **gland (7)** is then used to keep the packing in place. The gland is held in position by **two M16 studs (14).** The sub-assembly is slid over the valve stem, such that the cover is fastened to the body by **6 adjusting screws (13)**. **2 M20 threaded rods (10)** are then screwed into the cover.

Spring holders (12) are placed on either end of the **spring (4).** The sub-assembly is placed such that the dog end of the stem end gets into the lower spring holder. The **bridge plate (3)** is pushed over the threaded rod, and then the **hexagon adjusting screw (11)** is screwed into the bridge plate so that its dog end gets into the upper spring holder.

To complete this assembly the following design features are required:

(i) a method of sealing between the cover and the body, [2]

(ii) a means of locking the adjusting screw in a desired position, [4]

(iii) a method of hand operating the adjusting screw, [4]

(iv) a means of keeping the plate in position. [2]

Draw to a scale of **1:2** either in **first** or **third angle** projection, the following views of the complete assembly:

(a) a sectional elevation along the cutting plane **X-X,** as shown on the body, [52]

(b) in projection with view **(a),** a plan, [17]

(c) an outside end view in the direction of arrow **Y**. [19]

NB. Do **not** show hidden details.

Chamfers, small radii and dimensions **not** shown are left to your discretion.

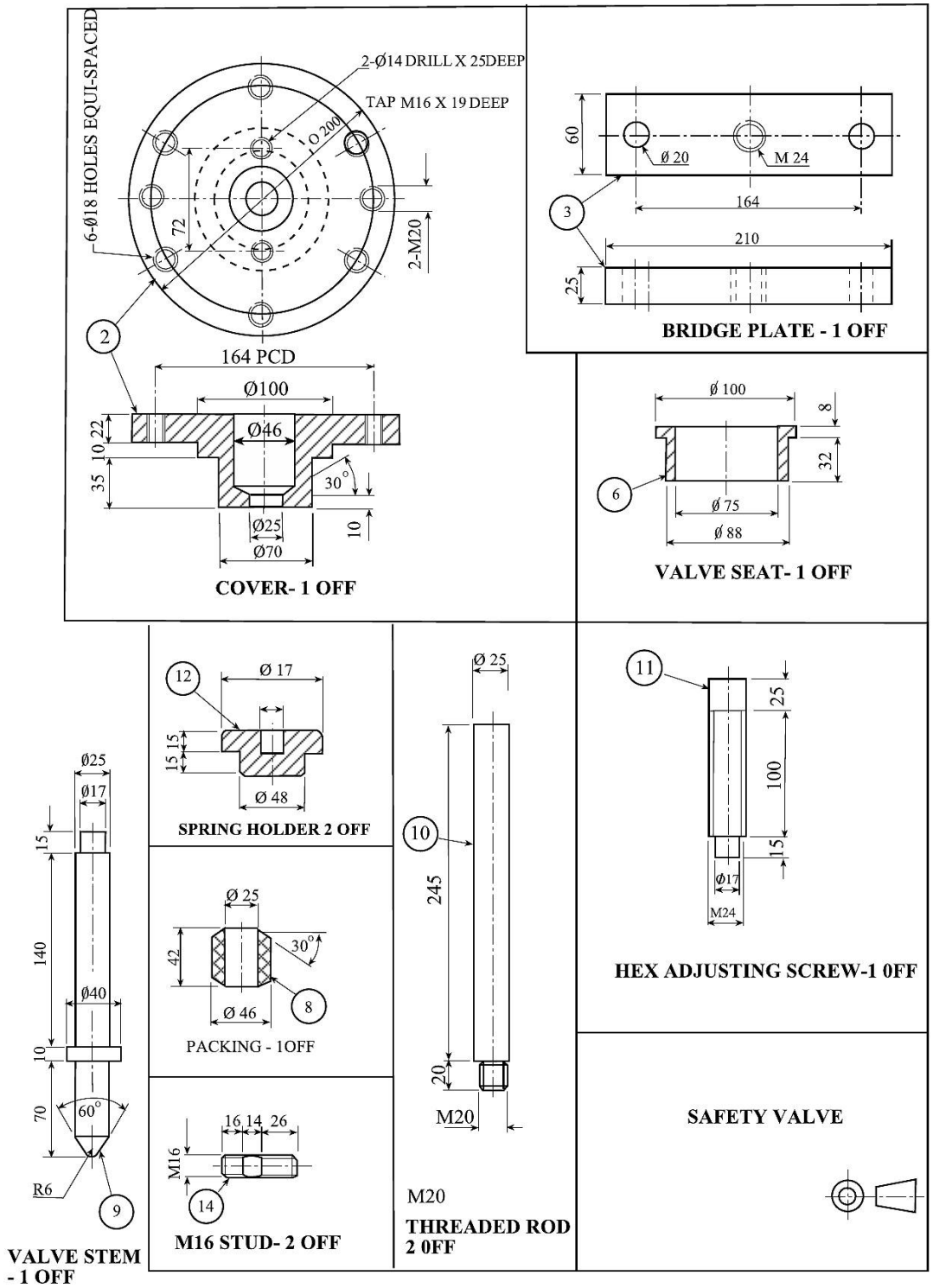

6-Ø18 HOLES EQUI-SPACED
2-Ø14 DRILL X 25DEEP
TAP M16 X 19 DEEP
O 200
72
2-M20
2
164 PCD
Ø100
Ø46
22
10
35
30°
Ø25
Ø70
10
COVER- 1 OFF
60
Ø 20
M 24
3
164
210
25
BRIDGE PLATE - 1 OFF
Ø 100
8
32
6
Ø 75
Ø 88
VALVE SEAT- 1 OFF
12
Ø 17
15
15
Ø 48
SPRING HOLDER 2 OFF
Ø 25
42
30°
8
Ø 46
PACKING - 1OFF
16 14 26
M16
14
M16 STUD- 2 OFF
Ø25
Ø17
15
140
Ø40
10
70
60°
R6
9
VALVE STEM - 1 OFF
Ø 25
10
245
20
M20
M20
THREADED ROD 2 0FF
11
25
100
15
Ø17
M24
HEX ADJUSTING SCREW-1 0FF
SAFETY VALVE

Fig.1 (a)

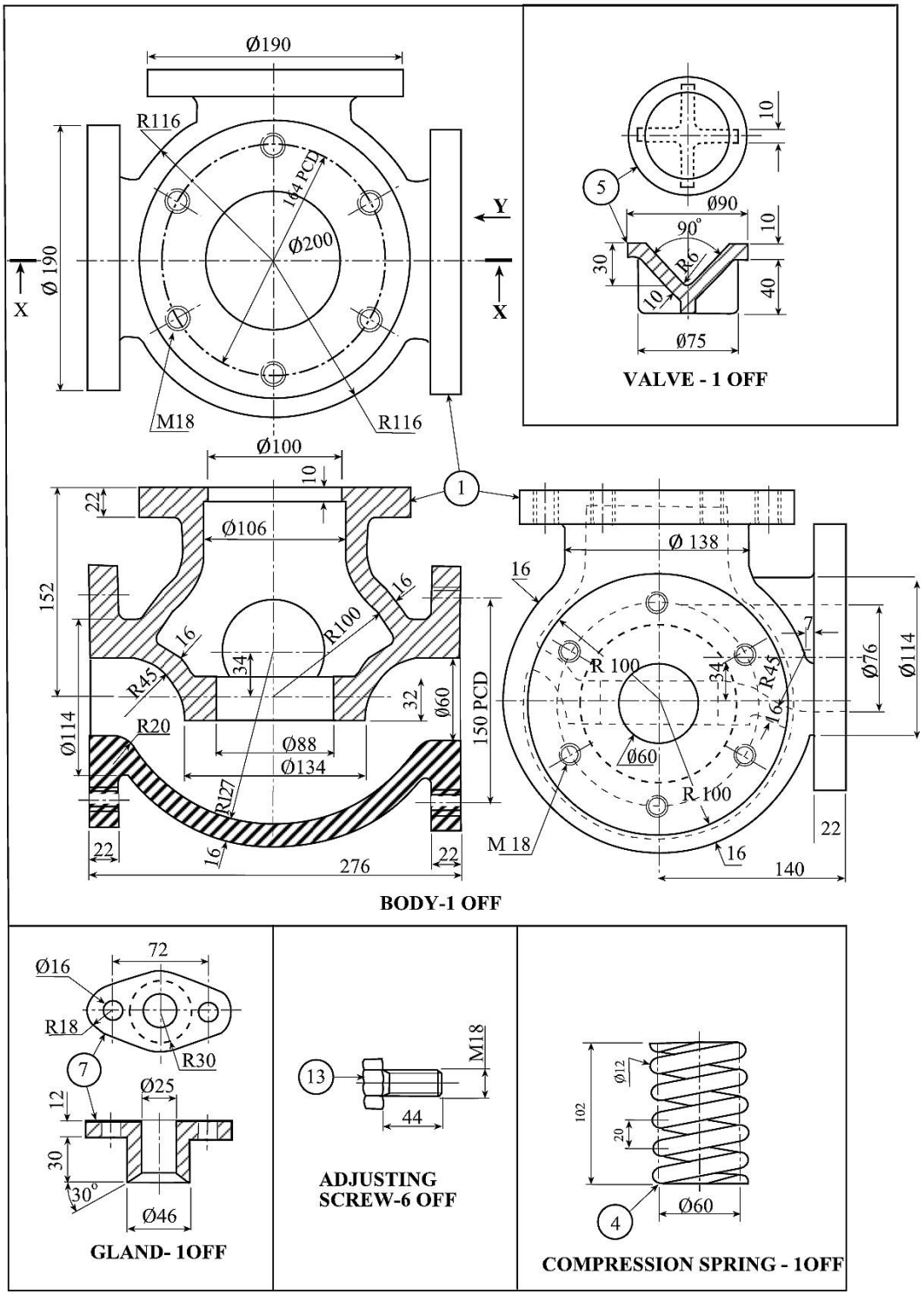

Ø190
R116
194 PCD
Ø200
Ø 190
X
Y
X
M18
R116
Ø100
10
22
Ø106
152
16
R100
16
R45
34
32
Ø60
Ø114
R20
150 PCD
Ø88
Ø134
R127
22
16
276
22
BODY-1 OFF
5
10
Ø90
90°
10
30
R6
10
40
Ø75
VALVE - 1 OFF
1
Ø 138
16
7
R 100
34
R45
16
Ø76
Ø114
Ø60
R 100
M 18
16
140
22
72
Ø16
R18
R30
7
Ø25
12
30
30°
Ø46
GLAND- 1OFF
13
M18
44
ADJUSTING
SCREW-6 OFF
Ø12
102
20
4
Ø60
COMPRESSION SPRING - 1OFF

Fig.1 (b)

Question 2

Details of components for a **WORM GEAR** are shown on **Fig 2(a)** and **2(b)**.

METHOD OF ASSEMBLY

The **thrust race (7)** is slid over the shorter end shaft of the **worm (6).** The **bush (8)** is also slid over the same shaft end of the worm to hold the thrust race bearing firm against the worm. This sub-assembly is fed into the **casting (1)** from the left. The **bush (9)** is inserted into the **end cover (13)** from the **Ø58** boss. The sub-assembly is mounted onto the longer end shaft of the worm and secured to the casting by six **M6** studs and nuts (not shown). The **bushes (4)** and **(5)** are inserted into the **Ø28** holes in the casting. The **shaft (3)** is then pushed through these bushes and through the **wormwheel (2).** The **end plates (10)** and **(11)** are then secured onto the casting by **four M6** hexagonal headed set screws (not shown). Finally, the **cover plate (12)** is secured onto the casting by **eight M6** hexagonal headed set screws (not shown).

(a) To complete the assembly, certain design features need to be considered and drawn in on the required views. Where necessary minor modifications may be made to the given components and any extra components added to complete the design requirements.

The design features are:

(i) a means of transmitting positive drive between the **shaft (3)** and the **wormwheel (2)**, [2]

(ii) a means of preventing leakage along the **shaft (3)**, [2]

(iii) a pulley to transmit positive drive to the **worm (6)**, [4]

(iv) a method of lubricating the bearing. [4]

(b) Draw **full size**, in either **first** or **third angle** projection:

(i) a sectional elevation **AA**. Show **worm (6)** and **wormwheel (2)** in mesh. [60]

(ii) an end view seen in the direction of arrow **Y**. Show a part section of the mesh between the worm and wormwheel. [26]

(c) Show the symbol of projection used. [2]

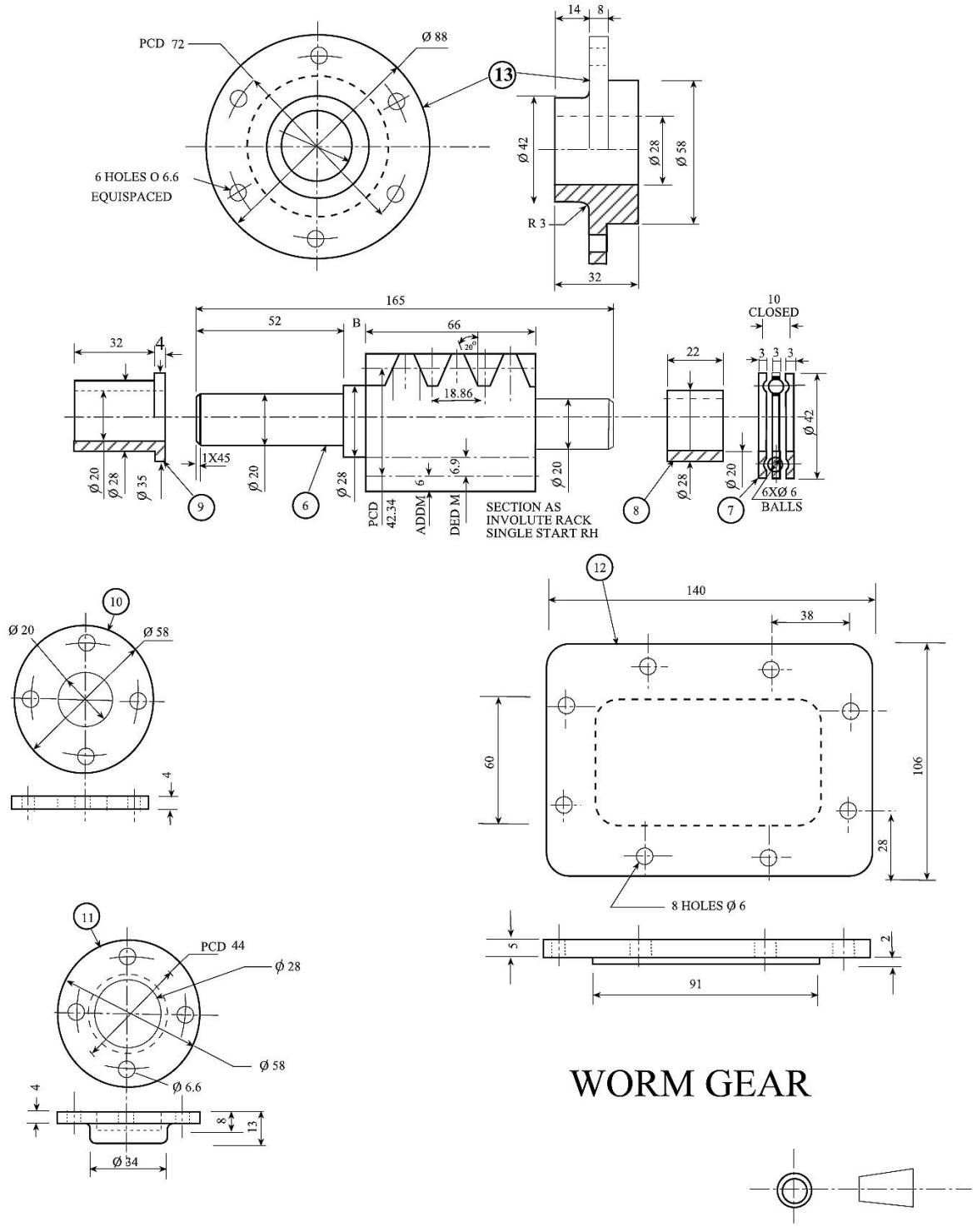

PCD 72
Ø 88
13
6 HOLES O 6.6
EQUISPACED
14
8
Ø 42
Ø 28
Ø 58
R 3
32
165
52
B
66
26°
18.86
32
4
1X45
Ø 20
Ø 28
Ø 35
9
Ø 20
6
Ø 28
6.9
6
PCD
42.34
ADDM
DED M
SECTION AS
INVOLUTE RACK
SINGLE START RH
Ø 20
8
22
10
CLOSED
3 3 3
Ø 42
Ø 28
Ø 20
6XØ 6
BALLS
7
10
Ø 20
Ø 58
4
12
140
38
60
106
28
8 HOLES Ø 6
5
2
91
11
PCD 44
Ø 28
Ø 58
Ø 6.6
4
8
13
Ø 34
WORM GEAR

Fig. 2(a)

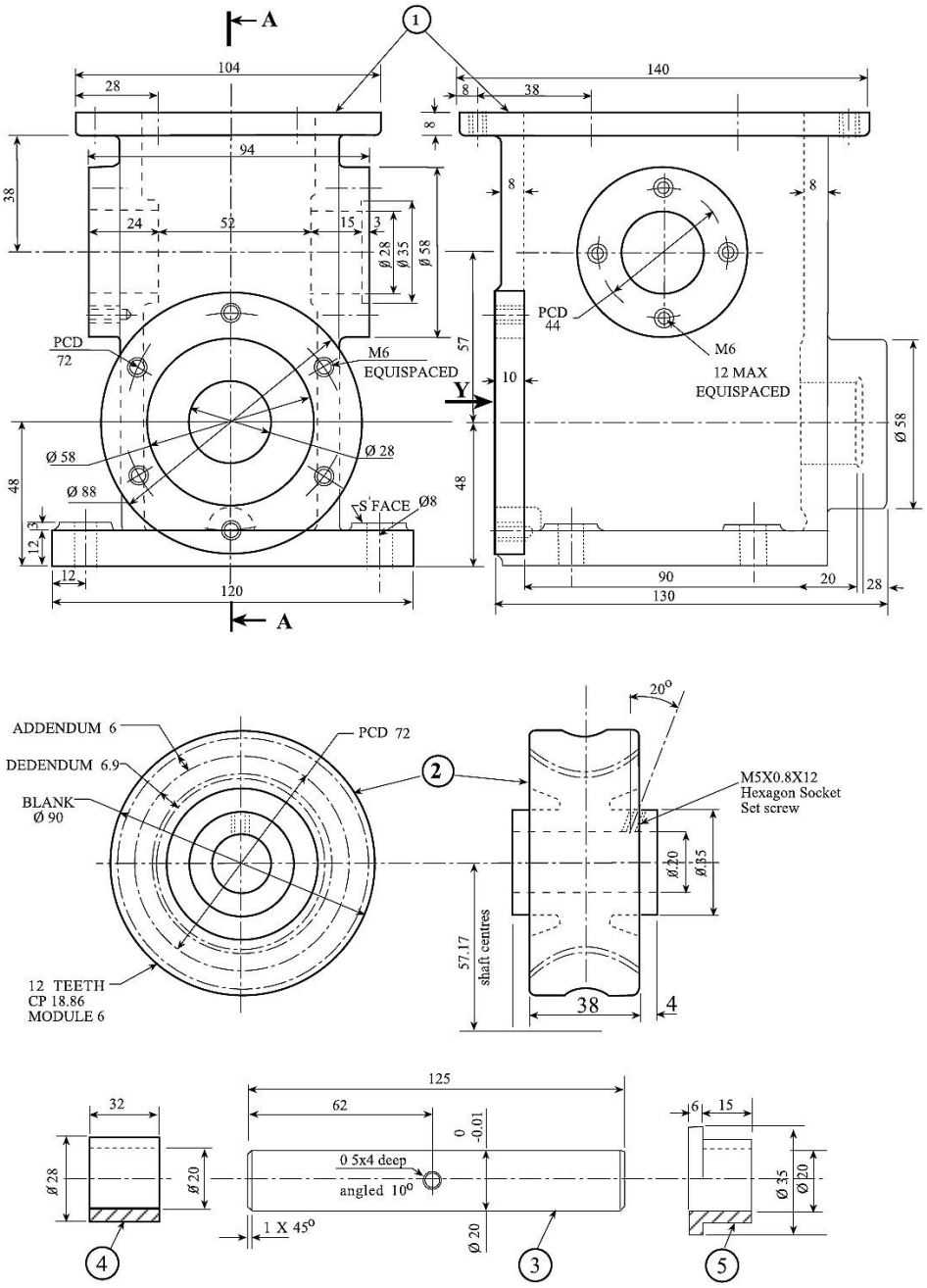

A
A
1
104
28
140
38
8
94
38
24
52
15
3
Ø 28
Ø 35
Ø 58
PCD
72
M6
EQUISPACED
57
Y
10
PCD
44
M6
12 MAX
EQUISPACED
Ø 58
Ø 28
Ø 88
48
48
3
12
12
120
S FACE Ø8
90
20
28
130
ADDENDUM 6
DEDENDUM 6.9
BLANK
Ø 90
PCD 72
2
20°
M5X0.8X12
Hexagon Socket
Set screw
Ø 20
Ø 35
57.17
shaft centres
38
4
12 TEETH
CP 18.86
MODULE 6
125
32
62
0
-0.01
6
15
Ø 28
Ø 20
0 5x4 deep
angled 10°
1 X 45°
Ø 20
Ø 35
Ø 20
4
3
5

Fig. 2 b

Question 3

The diagram of a complete ground floor and a **first** floor plan of a **two** storey house are given in **Figure 3.**

To complete the **first** floor and elevations, a number of design features are required. If necessary, minor modifications may be made to the given floor drawings. Any additional details must be drawn in.

(i) **5** bedrooms of which the main bedroom is en-suite,

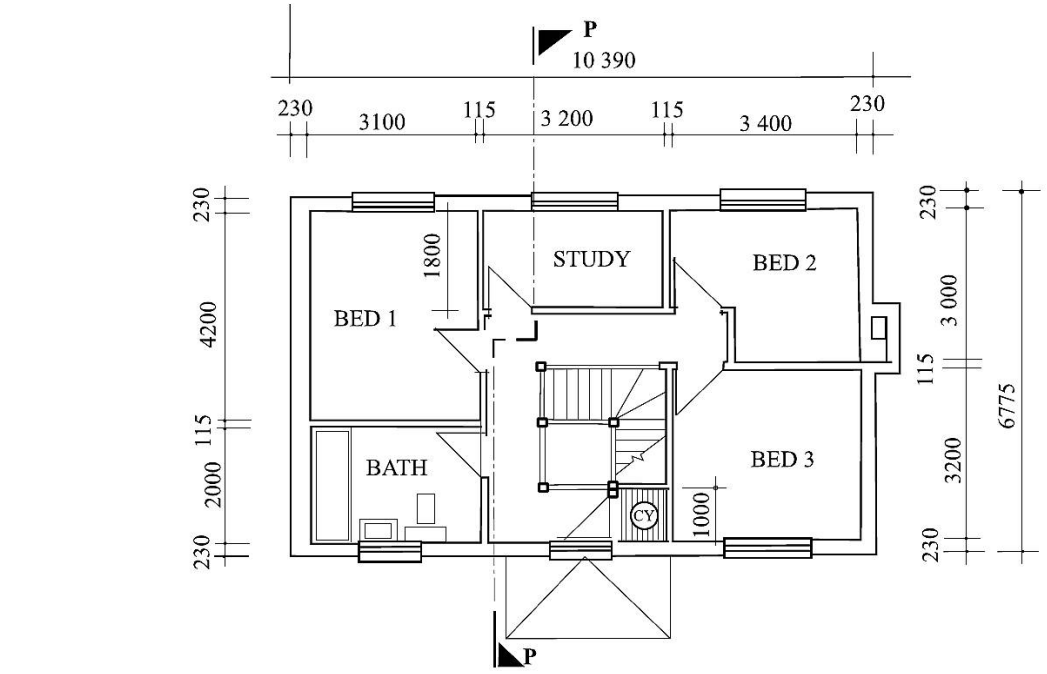
(ii) bathrooms and toilets,

(iii) guest room with bathroom and toilet, to be located above the garage,

(iv) balcony,

(v) suitable roof,

(vi) suitable openings.



FIRST FLOOR PLAN

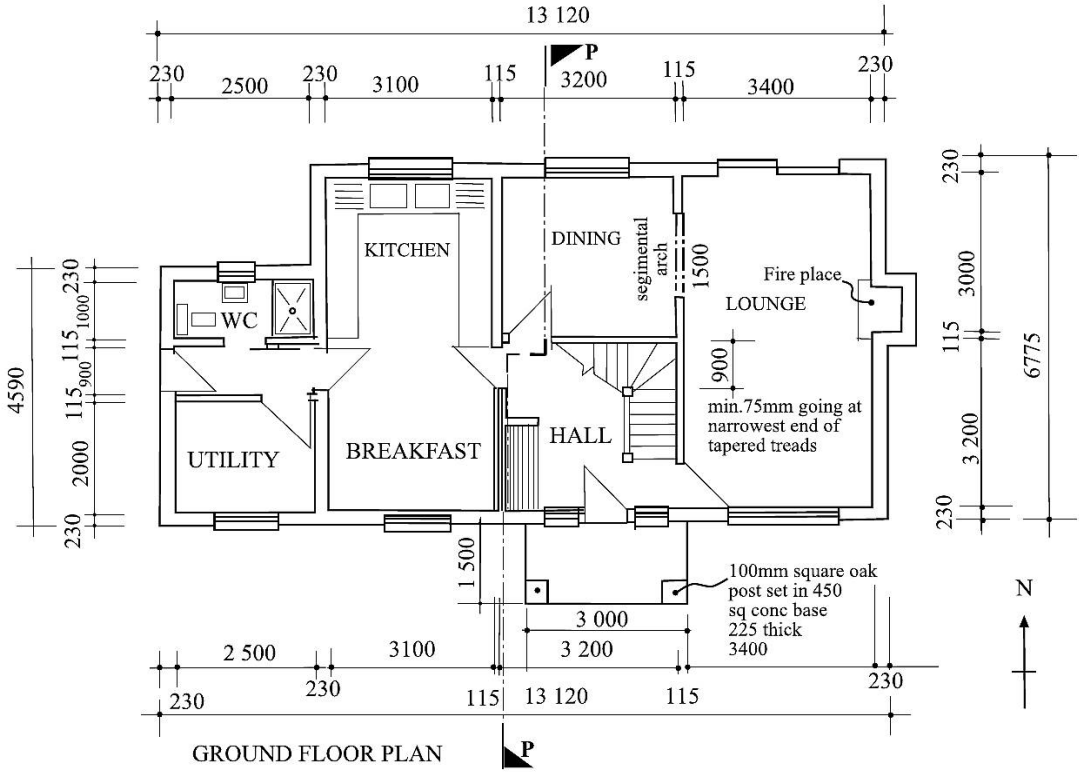


Fig. 3

Draw to scale **1:100** the following views of the complete building, with the design features incorporated:

(a) the given ground floor, [19]

(b) the first floor plan, [30]

(c) sectional elevation, through cutting plane **P-P**, [27]

(d) South elevation, [12]

(e) East elevation. [12]

Question 4

A complete **ground floor plan**, an outline of the **first floor plan** and a **side elevation** of a **family house** built on a slopping area are given in **figure 4**.

To complete the design, the following room layout needs to be considered on the **first floor:**

(i) **2** bedrooms,

(ii) dress area and bathroom,

(iii) built in cupboards.

Minor alterations, additions or extensions may be considered in the design layout.

With the layout of the design complete,

draw to a scale **1:100** the following views of the house:

(a) the ground floor plan, [15]

(b) the **first** floor plan, [25]

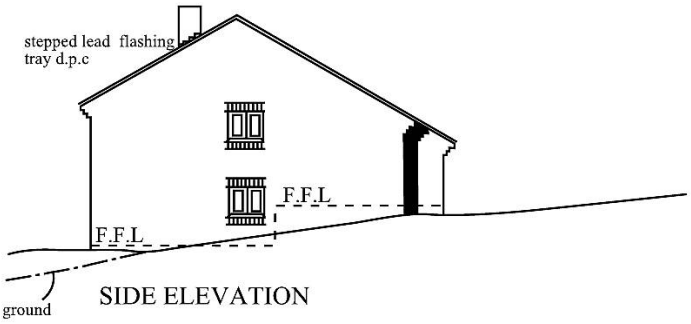
(c) the sectional elevation through cutting plane **Y-Y**, [40]

(d) the elevation as seen from the entrance hall side. [10]

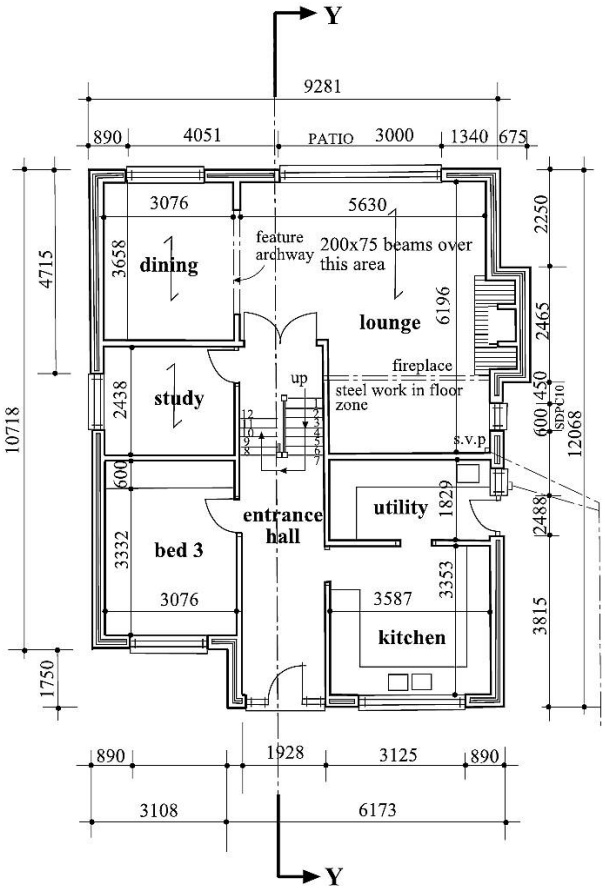
Design and draw a suitable septic tank and soakaway for the house. [10]

Note

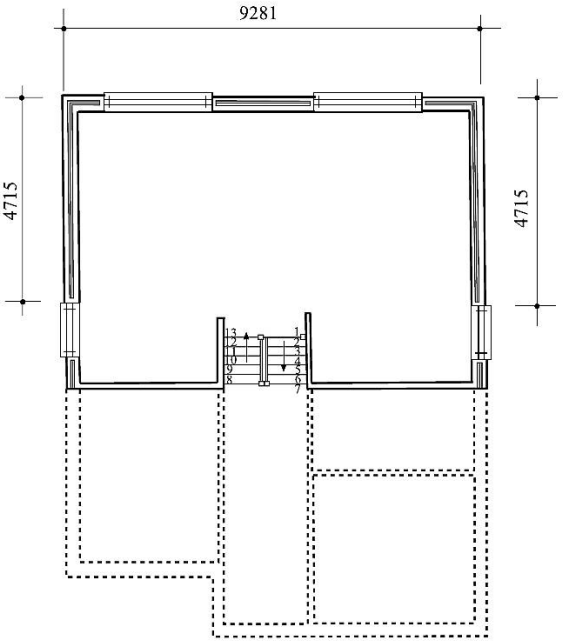
- **All** drawings should comply with the model building by-laws.
- **All** window and door openings refer to the schedule provided.
- Ignore the cavity in the walls of the given views.



SIDE ELEVATION



GROUND FLOOR PLAN



UPPER FLOOR PLAN

Fig.4

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