

G12 ECZ GMD P2 2016 GCE SOLUTIONS

Grade 12 ECZ Geometrical and Mechanical Drawing Paper 2, 2016 GCE (7040/2)

Construction/assembly methods -- this is a practical drafting exam, see note

practical drafting exam: the true answer is a full-size drawing on A2 paper. This PDF gives the exact construction/assembly method, not a rendering.

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for General Certificate of Education Ordinary Level

Geometrical and Mechanical Drawing 7040/2

Paper 2

Friday

5 AUGUST 2016

Additional materials:

A2 Drawing paper (1 sheet)

Standard drawing equipment

Time: 2 hours 40 minutes

Marks: 100

Instructions to Candidates

Print your **name**, **centre number** and **candidate number** at the bottom right-hand side of your drawing paper.

There are **two (2)** questions in this paper. Answer **both** questions.

Use **both** sides of the drawing paper for your answers.

Information for Candidates

The number of marks is given in brackets [] at the beginning of each section.

The insert contains **Figure 2** for Section 2.

You have an additional **10 minutes** to read carefully the text of Section 2 before answering the questions.

Arcs of circles less than **5mm radius** may be drawn freehand.

All dimensions are in millimetres unless otherwise stated.

Cell phones are not allowed in the examination room.

Answer the question **from section 1 on one side** of the drawing paper and that **from section 2 on the other side**.

All dimensions are in **millimetres**.

Section 1 (16 marks)

Candidates are advised to spend not more than 30 minutes on this section of the paper:

- 1 **Figure 1** shows two orthographic views of a **BRACKET** sketch (in freehand) a pictorial view of the bracket with point 'P' in the foreground of the view.

NB: The use of instruments when sketching or living-in will be heavily penalized. Faint construction lines and points used when preparing the sketch should not be erased.

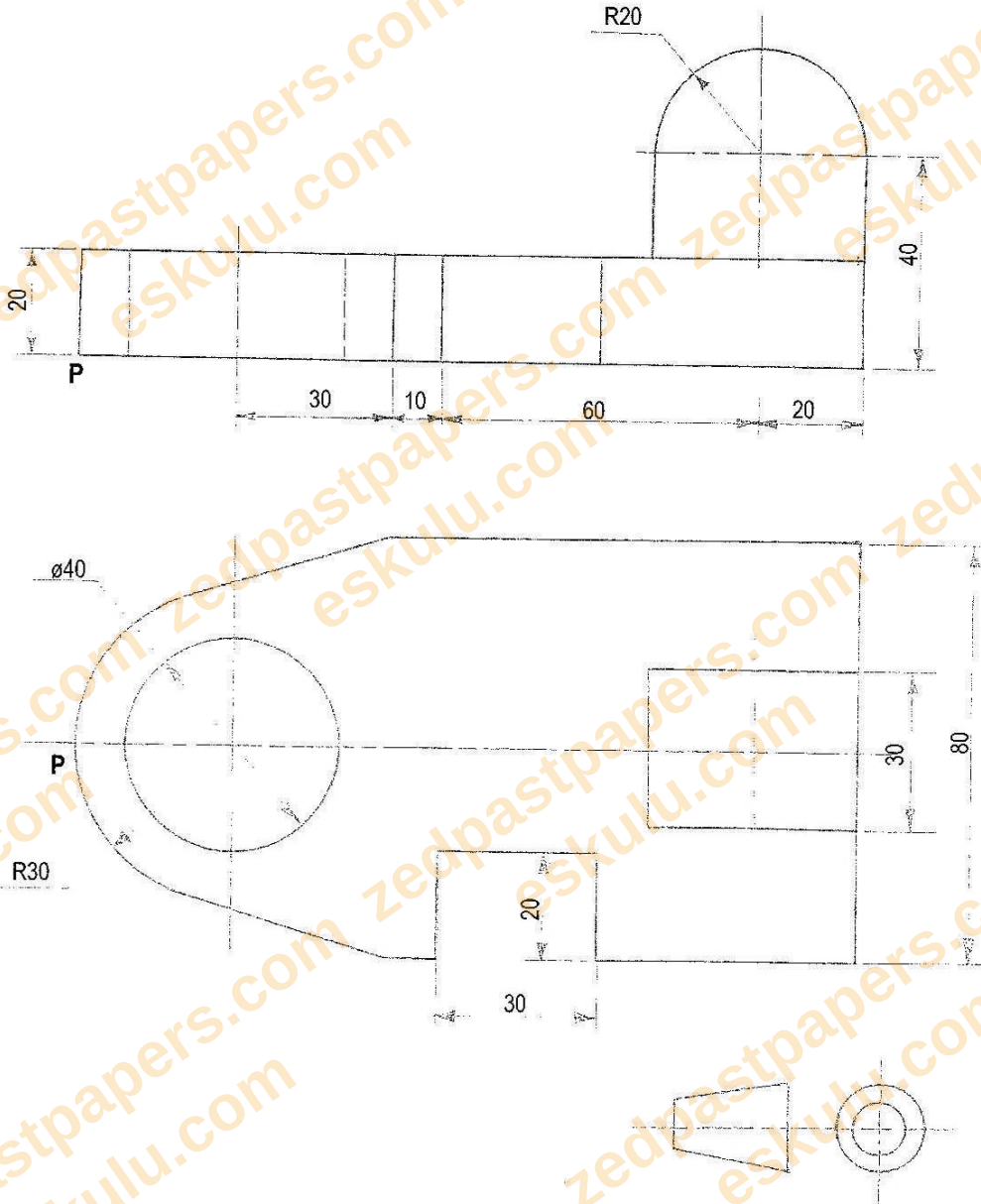


Figure 1

Section 2 (84 marks)

- 2 **Figure 2** shows in First Angle Projection details of the components of a **SWIVEL BRACKET** – which are assembled as follows:

The **PIVOT BLOCK** ② is inserted in the middle of the **SWIVEL BRACKET** ① until it is centrally located and the 12mm holes are in exact alignment.

The **PIVOT BLOCK SPINDLE** ③ is then pushed through the **SWIVEL BRACKET** ① from the left hand side and passing through the **PIVOT BLOCK** ② until it comes out of the other end. Its head has to lie flush with the **SWIVEL BRACKET** ①.

The **RETAINING RING** ④ is then tightly fitted to the 12mm end of the **PIVOT BLOCK SPINDLE** ③.

The two **LOCATING PINS** ⑤ are force fitted into the $\varnothing 6\text{mm}$ hole of the upper part of the **PIVOT BLOCK** ② until they go in completely.

The **SPINDLE LOCATING SCREW** ⑥ is then screwed into the middle tapped holed of the **PIVOT BLOCK** ① until its head lies flush to the surface and its shank touches the slotted part of the **PIVOT BLOCK SPINDLE** ③.

Using the **NUT** ⑦ and the **WASHER** ⑧, secure them to the lower end of the **SWIVEL BRACKET** ①.

Finally the **RETAINING RING** ④ is secured to the **PIVOT BLOCK SPINDLE** ③ by using the **LOCKING PIN** ⑨ to stop it from coming off.

With the components assembled as detailed above, draw full size the following views in **either first angle or third angle projection**.

- A **Sectional elevation**, the plane of the section and direction of the required view being indicated at **X – X**.
- A **Plan** as viewed from the arrow **P** on the front elevation.
- An **End elevation** as seen in the direction of arrow **E**

NB

Suitable dimensions should be estimated where data is not provided. **No hidden details or part lines are required in any view.**

Insert six important dimensions on your drawing: these should include each of the following – a horizontal length, vertical length, width, a diameter, a radius and the size of the nut.

In the lower right-hand corner of the drawing paper and on the same side as that on which you have drawn the solution to question 2, draw a title block and print in this block the following: **the title of the drawing for question 2, your name, examination number, the scale, and indicate by standard symbols the method of projection you have used.**

EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

**Geometrical and
Mechanical Drawing**

7040/2

PAPER 2

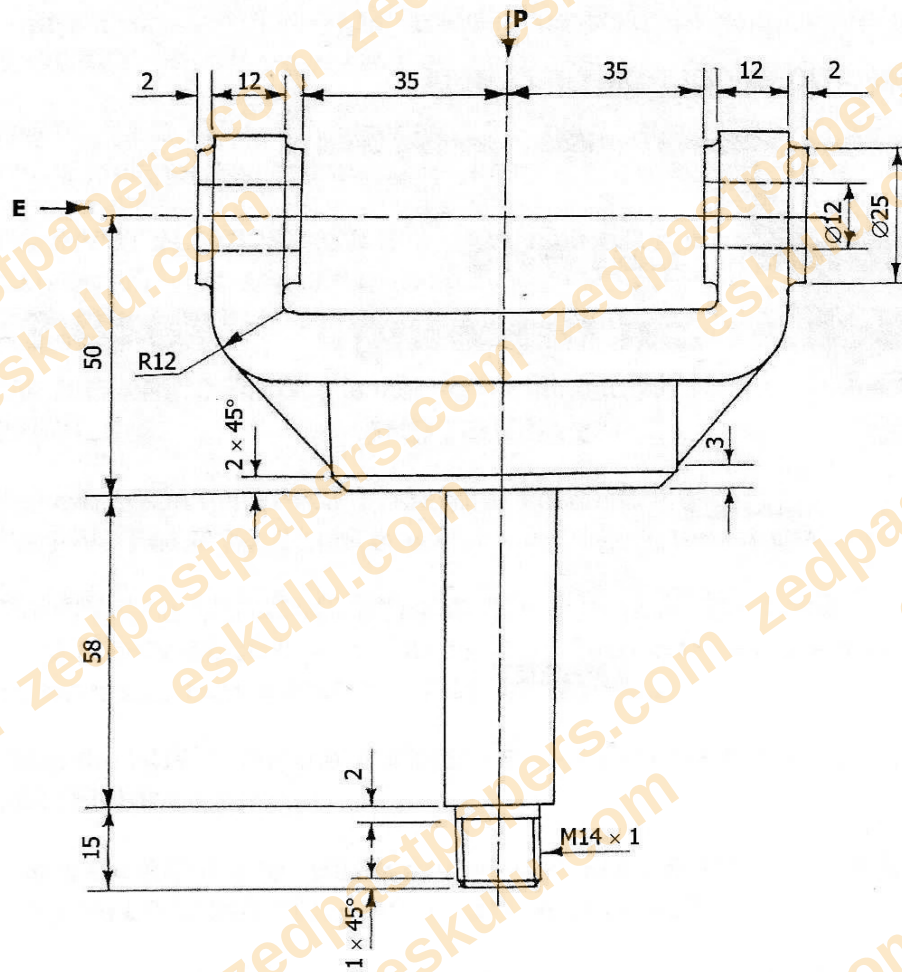
Friday

5 AUGUST 2016

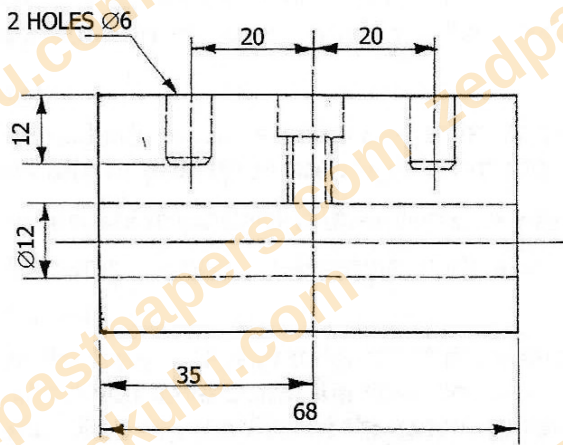
Additional materials:

A2 Drawing paper (1 sheet)
Standard drawing equipment

INSERT



1 SWIVEL BRACKET 1 OFF



2 PIVOT BLOCK 1 OFF

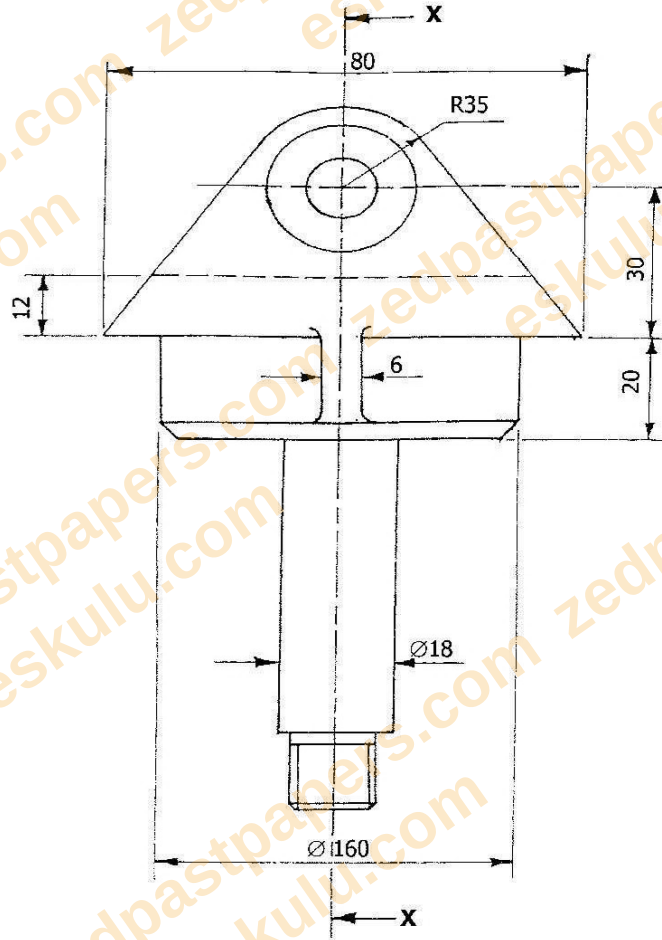
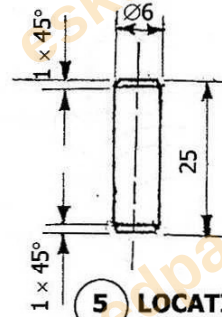
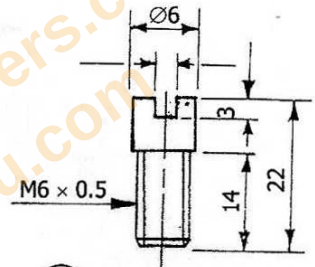


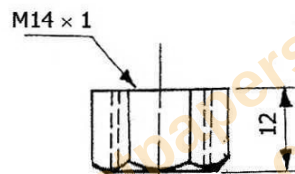
FIGURE 2



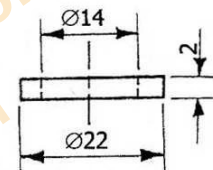
5 LOCATING PIN 2 OFF



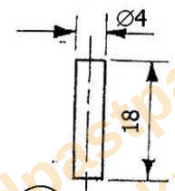
6 SPINDLE LOCATING SCREW 1 OFF



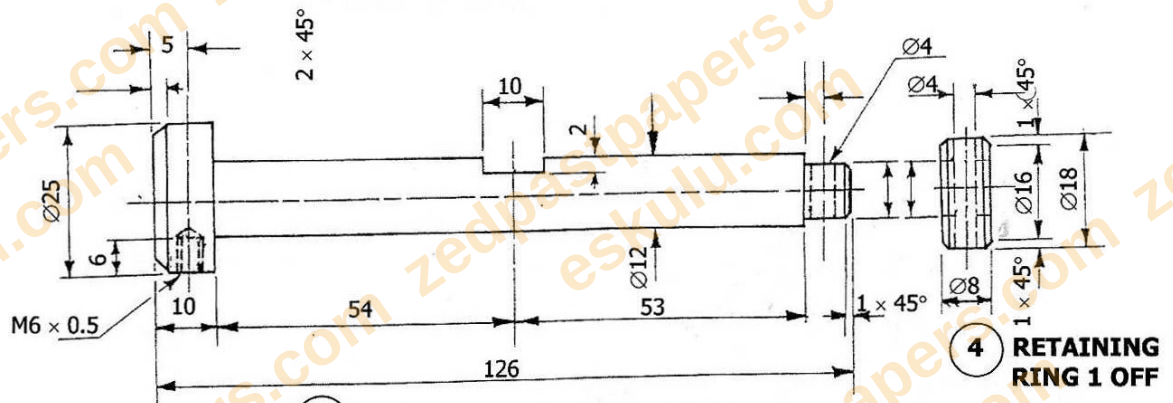
7 HEXAGONAL NUT 1 OFF



8 WASHER 1 OFF

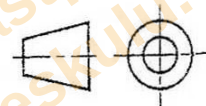


9 LOCKING PIN 1 OFF



3 PIVOT BLOCK SPINDLE 1 OFF

4 RETAINING RING 1 OFF





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Question 1. SECTION 1 [16]. Figure 1 shows two orthographic views of a BRACKET (30/10/60/20mm length divisions, 20/40mm heights, R20 rounded top boss, and a plan showing Ø40/R30 curves with a 30x20mm tab). Sketch freehand a pictorial view with point P in the foreground, no instruments.

Method: as with the equivalent internal-2016 question, this tests freehand proportion, not instrument accuracy. Build a mental 3D model from the two given views: an L-shaped/stepped base bracket (20mm then stepping to 40mm high, over a 30+10+60+20mm length) with a raised circular boss (R20 rounded top in the front view, Ø40 with an R30 blend in the plan) and a small rectangular tab (30x20mm) projecting from the base, with point P marking the front-left corner nearest the viewer.

Sketch freehand (oblique or isometric-style pictorial, angles estimated by eye, NOT measured with any instrument), starting from a light freehand bounding box in the given proportions, blocking in the stepped base first, then the rounded boss (sketched as a freehand near-circle, not compass-drawn) and the small tab, keeping point P as the nearest visible corner. Per the instructions, use NO instrument at any stage (including lining-in), and do NOT erase the faint construction lines/points.

Answer: Answer: correct procedure is freehand-only (no instruments, construction lines left visible), built from a light bounding box in the given proportions (overall length 30+10+60+20=120mm, heights 20 to 40mm, boss R20/Ø40/R30), with point P positioned as the nearest corner to the viewer.

Question 2. SECTION 2 [84]. Figure 2 (insert) shows a SWIVEL BRACKET assembly: SWIVEL BRACKET (1), PIVOT BLOCK (2), PIVOT BLOCK SPINDLE (3), RETAINING RING (4), 2x LOCATING PINS (5), SPINDLE LOCATING SCREW (6), NUT (7), WASHER (8), LOCKING PIN (9). Assemble per the given instructions and draw, full size, in first- or third-angle projection: (a) a sectional elevation on X-X; (b) a plan viewed from arrow P; (c) an end elevation viewed from arrow E. Insert 6 varied BS308 dimensions (horizontal length, vertical length, width, a diameter, a radius, and the nut size) and a title block.

Assembly logic (transcribed directly and unambiguously from the given instructions, independent of the insert's exact dimensions): the PIVOT BLOCK (2) is inserted into the middle of the SWIVEL BRACKET (1) until centrally located, with both parts' 12mm holes in exact alignment. The PIVOT BLOCK SPINDLE (3) is then pushed through the SWIVEL BRACKET (1) from the LEFT-HAND side, passing through the PIVOT BLOCK (2), until it emerges from the other end -- its head must lie FLUSH with the swivel bracket's left face. The RETAINING RING (4) is then tightly fitted onto the 12mm end of the spindle (3).

The two LOCATING PINS (5) are force-fitted into the Ø6mm hole of the pivot block's (2) upper part until fully seated. The SPINDLE LOCATING SCREW (6) is then screwed into the pivot block's (2) middle tapped hole until its head lies flush with the surface and its shank touches the slotted part of the spindle (3) -- this is what prevents the spindle from rotating/sliding once assembled. The NUT (7) and WASHER (8) are used to secure the lower end of the swivel bracket (1). Finally, the retaining ring (4) is secured onto the spindle (3) using the LOCKING PIN (9), to stop the ring coming off.

(a) Sectional elevation on X-X: this section (cutting vertically through the assembly's central axis, per X-X as indicated on the plan) must expose, in order: the swivel bracket's (1) body with the pivot block (2) seated centrally inside it (12mm holes aligned); the spindle (3) running through both from the left, its head flush with the bracket's left face, and its slotted/locating-screw end visible on the right with the

retaining ring (4) and locking pin (9) fitted; the locating pins (5) shown seated in the pivot block's upper Ø6mm holes; the spindle locating screw (6) shown threaded in, its shank touching the spindle's slot; and the nut (7) + washer (8) securing the lower end of the swivel bracket. All cut solid material is hatched at 45 degrees; fasteners (spindle, screw, nut, pins, locking pin) are conventionally shown UNSECTIONED (in true elevation) even though the cutting plane crosses them, per standard drafting convention. No hidden lines are required, per the instruction.

(b) Plan viewed from arrow P: shows the assembly from above, with the swivel bracket's outline, the pivot block visible centrally, and the two locating pins' positions visible in the pivot block's upper face.

(c) End elevation viewed from arrow E: shows the assembly from the end, revealing the spindle's circular cross-section, the retaining ring and locking pin at that end, and the swivel bracket's end profile.

Suitable BS308 dimensions to insert (6 required, of varied character, per the instruction): a HORIZONTAL length (e.g. the swivel bracket's overall length), a VERTICAL length (e.g. its overall height), a WIDTH (e.g. the pivot block's width), a DIAMETER (e.g. the spindle's shaft diameter or the 12mm aligned holes), a RADIUS (e.g. a rounded corner on the bracket), and the NUT size (e.g. 'M12' or similar, matching whatever thread size is estimated for the nut/spindle, since exact data is not given and should be estimated as instructed). Title block (bottom-right, same side as the Q2 solution): title 'SWIVEL BRACKET -- SECTIONAL ASSEMBLY', candidate name, examination number, scale (1:1), and the BS308 projection symbol matching whichever of first- or third-angle projection was actually used.

Answer: Answer: assembly order is Swivel Bracket -> Pivot Block (centred, 12mm holes aligned) -> Pivot Block Spindle (pushed through from the left, head flush) -> Retaining Ring (fitted to the spindle's 12mm end) -> 2x Locating Pins (force-fitted into the pivot block's Ø6mm holes) -> Spindle Locating Screw (threaded in, shank touching the spindle's slot) -> Nut + Washer (securing the bracket's lower end) -> Locking Pin (securing the retaining ring). Section X-X, plan from arrow P, and end elevation from arrow E must each show this fully assembled stack per the detailed method above (fasteners unsectioned, no hidden lines).

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