

G12 ECZ GMD P2 2017 GCE SOLUTIONS

Grade 12 ECZ Geometrical and Mechanical Drawing Paper 2, 2017 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

Monday

17 JULY 2017

Additional Material(s):

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** in the Title Block 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 end of each question or part question.

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.

Section 1 (16 marks)

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

- 1** **Figure 1** shows a **CASTING BRACKET** in first angle projection. Make a freehand pictorial sketch of this component – approximately full size with **P** as the lowest point in the foreground.

NB: The use of instruments will be severely penalized. Faint construction lines and points used when preparing the sketch should not be erased.

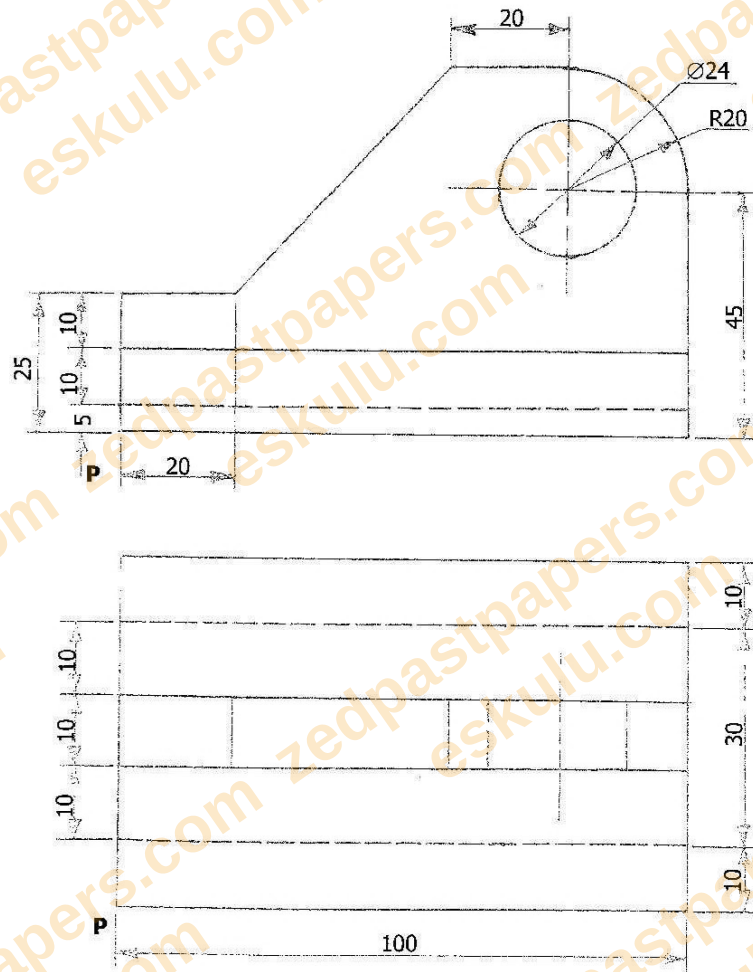


Figure 1

Section 2 (84 marks)

2 **Figure 2** shows details of the components of a **ROLLER BEARING**.

The components are assembled as follows:

The **Bush** ⑤ is fitted in the 28mm diameter hole in the **Roller** ⑥. The **Shaft** ⑦ is then inserted into the 20mm hole of the **Bush** ⑤ until the Roller is centrally positioned.

The sub assembly is then fitted on top of the **Body** ① with the shaft resting on the R10 semi-circular holes. The **bearing Caps** ② are fitted on top of the **Body** ① so that the 10mm diameter holes are aligned with the M10 blind tapped holes in the body.

The **Studs** ③ are inserted into the 10mm diameter holes of the **Bearing Cap** and screwed into the M10 blind holes. The **Washers** ④ are inserted into the four studs and screwed by means of four M10 hexagonal nuts.

Draw full size, in either **first** or **third angle projection** a fully assembled:

- (a) Front elevation looking in the direction of arrow **F**.
- (b) Sectional End Elevation, the plane of the section and direction of the required view being indicated at **X – X** on the front elevation.

Note: The Plan is not required.

- Suitable dimensions should be estimated where not provided. Hidden details not required in any view.
- Insert the following dimensions on the views using the recommended BS 308 standard.
 - (i) a horizontal dimension
 - (ii) a vertical dimension
 - (iii) a diameter
 - (iv) the size of the screw thread
- (c) On the same side of your drawing showing these views, draw a **Title block**.

Print in this **Title block**: a Title, Scale, Centre and Projection symbol using the recommended BS 308.

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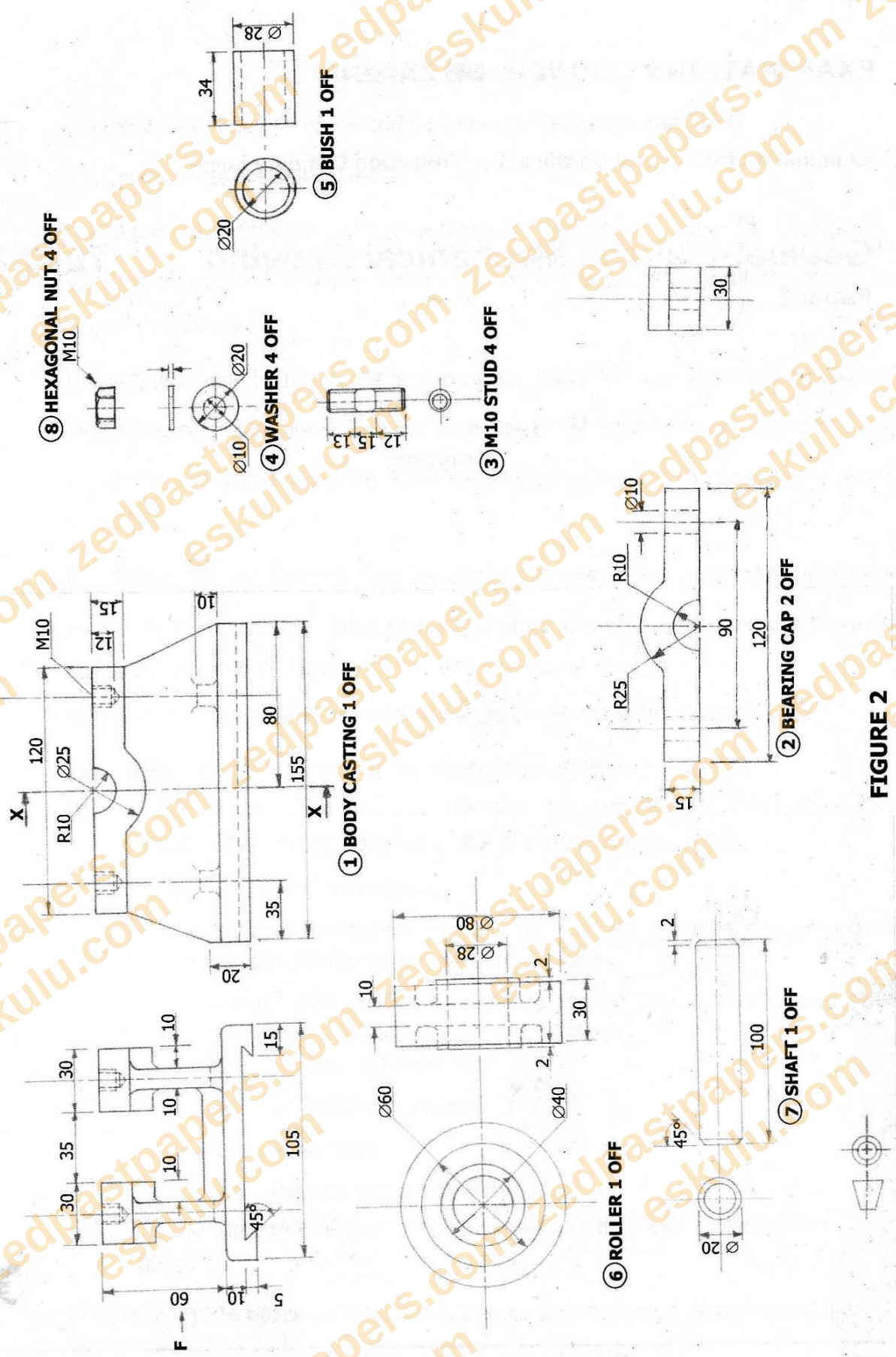
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INSERT





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Question 1. SECTION 1 [16]. Figure 1 shows a CASTING BRACKET in first-angle projection (a wedge/ramp base with a rounded $\text{Ø}24/\text{R}20$ boss at the top, 100mm-long stepped rear profile). Make a freehand pictorial sketch, approximately full size, with point P as the lowest point in the foreground, no instruments.

Method: as with other GMD freehand questions, this tests proportion, not instrument accuracy. Build a mental 3D model from the two given views: a wedge-shaped bracket rising from a 20mm-wide base (25mm total height at the front) up to a rounded boss ($\text{Ø}24$ bore, R20 outer radius, 45mm total height) at the back, sitting on a long stepped rectangular base (100mm long, three internal step divisions), with point P marking the front-bottom 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 overall proportions (base 100mm long, heights 25 to 45mm), blocking in the wedge/ramp shape first, then the rounded boss (sketched as a freehand near-circle, not compass-drawn), keeping point P as the nearest visible corner. Per the instructions, use NO instrument at any stage, 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 (base 100mm, heights 25-45mm, boss $\text{Ø}24/\text{R}20$), with point P positioned as the nearest corner to the viewer.

Question 2. SECTION 2 [84]. Figure 2 (insert) shows a ROLLER BEARING assembly: BODY (1, with R10 semi-circular shaft seats and M10 blind tapped holes), BEARING CAPS (2, with 10mm holes), STUDS (3), WASHERS (4), BUSH (5), ROLLER (6, with a 28mm hole), SHAFT (7). Assemble per the given instructions and draw, full size, in first- or third-angle projection: (a) a front elevation looking in the direction of arrow F; (b) a sectional end elevation on X-X (indicated on the front elevation). Insert 4 BS308 dimensions (horizontal, vertical, diameter, screw-thread size) and a title block.

Assembly logic (transcribed directly and unambiguously from the given instructions): the BUSH (5) is fitted into the roller's (6) 28mm-diameter hole. The SHAFT (7) is then inserted into the bush's (5) 20mm hole until the ROLLER is centrally positioned on the shaft. This bush-roller-shaft sub-assembly is then fitted on top of the BODY (1), with the shaft resting in the body's R10 semi-circular seating holes.

The BEARING CAPS (2) are then fitted on top of the BODY (1), so that their 10mm-diameter holes align with the body's M10 blind tapped holes. The STUDS (3) are inserted into the bearing cap's (2) 10mm-diameter holes and screwed into the body's M10 blind holes. Finally, the WASHERS (4) are placed onto the four studs and secured with four M10 hexagonal NUTS.

(a) Front elevation looking in the direction of arrow F: shows the fully assembled bearing from the front -- the body's outline with the bearing caps on top (secured by the 4 visible stud/washer/nut assemblies at the corners), and the roller/shaft assembly visible in the centre, its shaft ends supported in the body's R10 seats and capped by the bearing caps.

(b) Sectional end elevation on X-X (the section plane indicated on the front elevation, cutting through the shaft's axis): this section must expose, in order from bottom to top: the body's R10 semi-circular seat with the shaft resting in it (the shaft shown UNSECTIONED, in true elevation, per fastener/shaft

convention, even though the cutting plane passes through its axis); the bush and roller around the shaft (both cut and hatched, since they are solid material crossed by the section, except the roller's own bore around the bush); and the bearing cap on top, with its stud passing down into the body (the stud also shown unsectioned per convention). All cut solid material (body, bearing cap, bush, roller) is hatched at 45 degrees; no hidden lines are required (and the plan is NOT required, per the instruction).

Suitable BS308 dimensions to insert (4 required, per the instruction): a HORIZONTAL dimension (e.g. the body's overall length), a VERTICAL dimension (e.g. the body's overall height), a DIAMETER (e.g. the roller's outer diameter or the shaft diameter), and the screw-thread size (M10, as explicitly given for the studs/nuts). Title block (same side as the Q2 solution): title 'ROLLER BEARING -- ASSEMBLY', scale (1:1), centre (candidate details), and the BS308 projection symbol matching whichever of first- or third-angle projection was actually used.

Answer: Answer: assembly order is Bush (fitted into the Roller's 28mm hole) -> Shaft (inserted through the bush's 20mm hole, centring the roller) -> this sub-assembly seated in the Body's R10 semi-circular seats -> Bearing Caps (fitted on top, 10mm holes aligned with the body's M10 tapped holes) -> Studs (through the caps' 10mm holes, screwed into the body's M10 holes) -> Washers + M10 Nuts (securing the 4 studs). Front elevation (arrow F) shows the full assembly from the front; sectional end elevation (X-X) cuts through the shaft's axis, showing the body/bush/roller/cap hatched and the shaft/studs unsectioned per fastener convention. No plan or hidden details are required, per the instructions.

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