UNIVERSITY OF GREATER MANCHESTER

OFF CAMPUS DIVISION

WESTERN INTERNATIONAL COLLEGE, RAS AL KHAIMAH

BENG(HONS) MECHANICAL ENGINEERING

SEMESTER ONE (AND RESIT) EXAMINATION

2025/2026

GRAPHICAL COMMUNICATIONS & COMPUTER MODELLING

MODULE NO: AME4065

Date: Thursday, 15th January 2026 **Time: 1:00pm – 3:00pm**

INSTRUCTIONS TO CANDIDATES:

Total Marks: 100

Assessment Weight: This examination represents 40% of the total assessment for Graphical Communications & Computer Modelling.

Instructions:

- Answer all questions.
- Begin each question on a new sheet.
- BS EN 20286-2 tolerance tables are provided.
- Use appropriate scale and conventions. All dimensions are in millimeters unless otherwise stated.
- If you are unsure about any aspect, ask the invigilator.

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Q1a.
Identify the mistake and name the view indicated by X in the below Figure Q1.A.

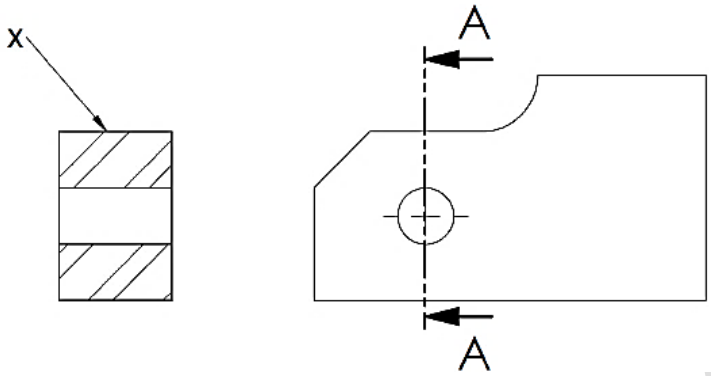

Figure Q1: Types of Hole-Preparation and Finishing Tools

Answer: _____

(3 Marks)

Q1b.
Write out in full the meaning of the following Standard Drawing abbreviation seen on engineering drawings:

I. CBORE ……..

II. TYP ……..

III. DRG ……..

IV. THRU ……..

(1×4 = **4 Marks)**

Q2.
Write the standard abbreviation for the following when required on an engineering drawing:

I. DIAMETER …….

II. PITCH CIRCLE DIAMETER …….

III. MATERIAL ……..

IV. SURFACE ROUGHNESS …….

(1×4 = **4 Marks)**

Please turn the page

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Q3.

A transparent splash-guard door is required for a CNC milling cell where high-pressure coolant is used; frequent wipe-downs with alkaline cleaners are expected. The guard must: permit operator visibility; resist impact from small chips; be chemical-resistant; and meet relevant machine safety requirements.

a) Select a suitable material and protective finish (if any). Justify your choice against the functional, H&S, and environmental requirements. (6 marks)

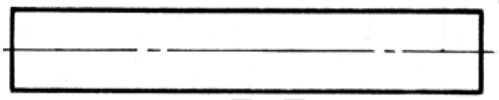
b) Name two relevant standards/codes that must be referenced on the drawing (e.g., for machine safety and for plastics/metal specs) and state their role briefly. (2 marks)

c) Sketch a front view of the guard panel indicating: overall size, hinge/slot detail, surface finish symbol for the viewing area, and an edge radius call-out with tolerance. (2 marks)

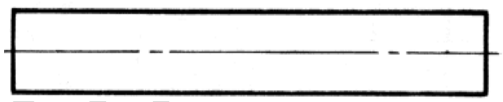
(10 marks)

Q4. Using the partially completed figures below, sketch the standard representation for the following features which might appear on an engineering drawing:

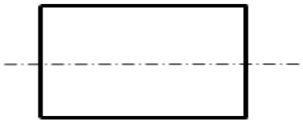
- **Conventional sign of a round bar** (3 marks)



- **Hexagonal headed screw:** (3 marks)



- **A Straight Knurl on a shaft** (3 marks)



(9 Marks)

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Q5.

A cross-sectional view of a shaft, bush bearing and housing assembly is shown in the **figure Q5** below. In this arrangement, the shaft is designed for a "close running" fit within the bush bearing, while the bush bearing is installed as a "press fit" within the housing.

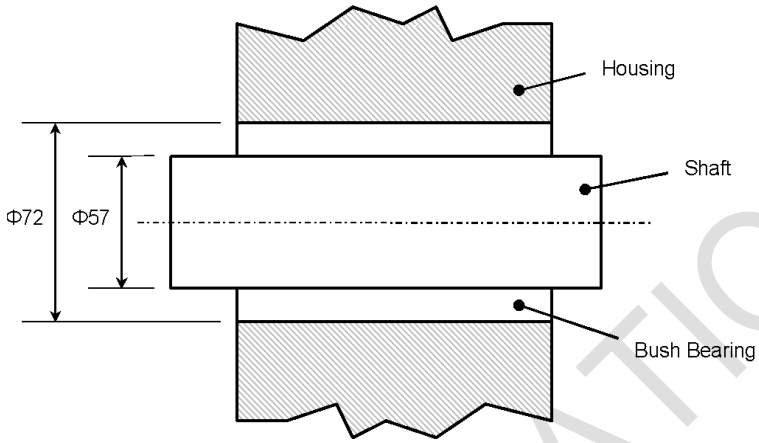

Figure Q5: Cross-sectional view of a shaft, bush bearing and housing assembly

Using the BS EN 20286-2 Tolerance Tables provided, classify the type of fit for each pairing, identify the tolerance limits, and fill in the required values in the **Table** below for the fits between the components.

Table: Fits and Tolerance Table

Between Components	Grade of Tolerance	Type of Fit	Limits of Size for:	Size of Tolerance
Bush/Shaft	H7 g6		Bush	
			Shaft	
Housing/Bush	H7 p6		Housing	
			Bush	

(12 Marks)

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Q6.

State name and describe the meaning of the following Geometrical Tolerance symbols:

a. ○ ……

……

……

b. ▱ ……

……

……

c. ⌯ ……

……

……

(2×3 = 6 marks)

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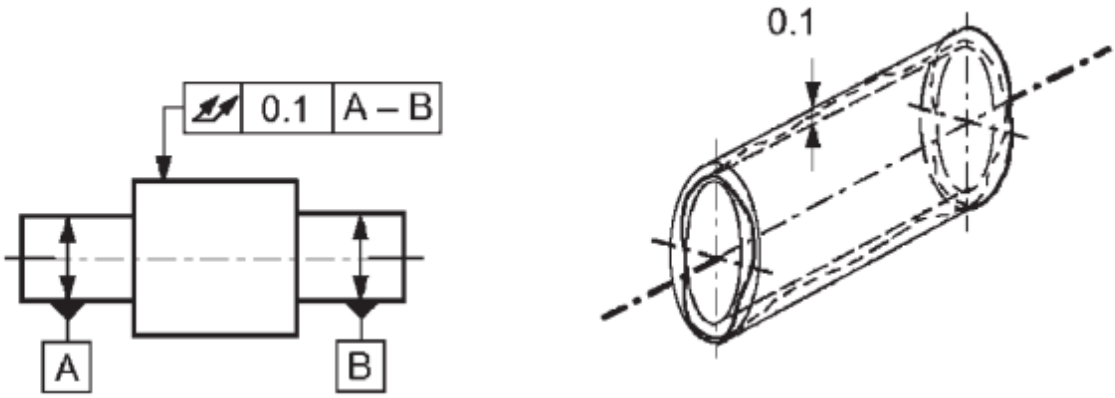
Q7.

Produce a full-size first-angle orthographic projection of the component shown in Figure Q8. Include the following views:

- Front view
- End elevation as indicated
- Plan view

All necessary hidden details should be shown and an isometric view is provided for clarity. Dimensions not given may be estimated proportionally.

State the meaning of the following Geometrical Tolerance statement(s) as seen on an engineering drawing depicted in **Figure Q7** below:



(All dimensions in mm)

Figure Q7: Tolerance of Cylindrical surface Relative to Datum Axis A–B

……

……

……

……

……

……

(8 marks)

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Q8. An isometric drawing of an Angle Bracket is given below in **Figure.** The drawing is not to the scale. Use view shown below with an arrow for drawing reference.

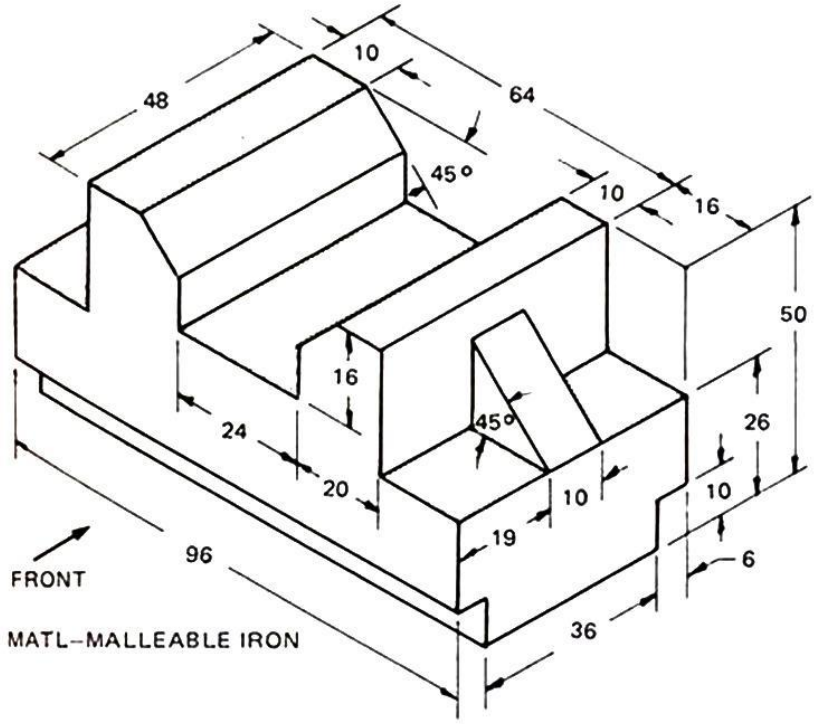

Figure: Angle BracketSketch in 1st Angle Projection, the Elevation and Plan view of the given drawing in **SHEET 8** with proper projection symbol and student number in title block.

a. Elevation View (05 marks)
b. Plan View (05 marks)
c. Student number: 1 mark and Projection symbol: 1 mark) (02 marks)

(**Total 12 marks)**

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Q9.

Figure Q9 shows the pictorial views of an object. Using First Angle Projection Method draw (a)
Front View; (b) Top View; (c) Side View, by obtaining Front View in the direction of' X',
Also, obtain the sectional views for the cutting plane shown in the figure.

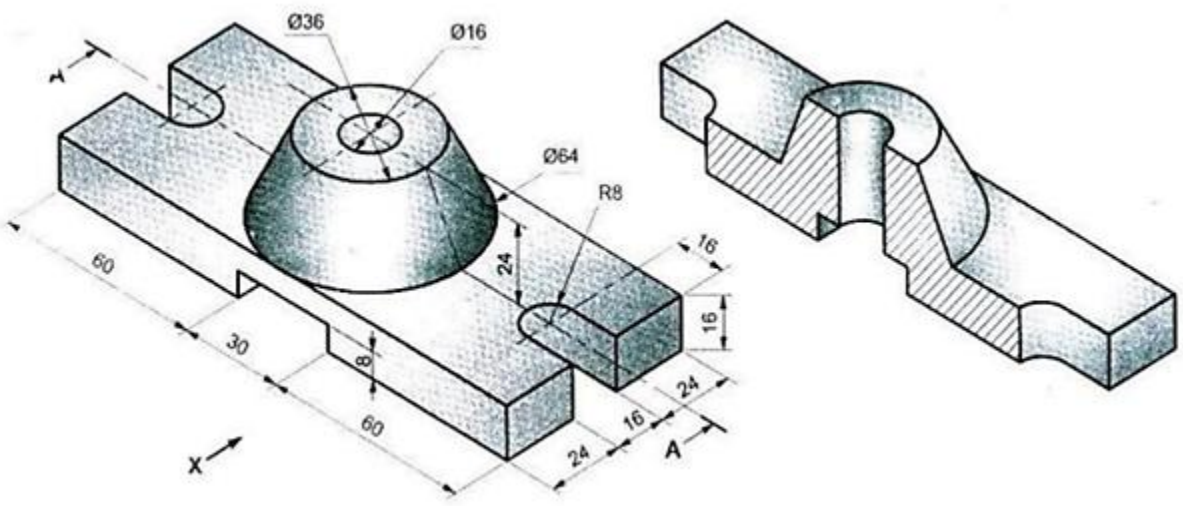

Figure Q9: Pictorial views

(12 marks)

Q10. Shown below is the '**Universal Coupling Parts'** drawing on **page 8**, the components that make up a Universal Coupling Assembly. Each part is dimensioned appropriately with two views for reference. (The drawing is in mm):

- Use a pencil and setsquares and draw an **assembly drawing** in **SHEET Q8**.
- Show all the parts assembled in their correct positions and hatched according to drawing conventions.

a) Complete Front View in good proportion (10 marks)
b) Sectioning of the assembly drawing (4 marks)
c) Balloon reference the assembly (2 marks),
d) Create Part list of the assembly (4 marks)

(Total: 20 Marks)

END OF QUESTIONS
Please turn the page for additional sheets

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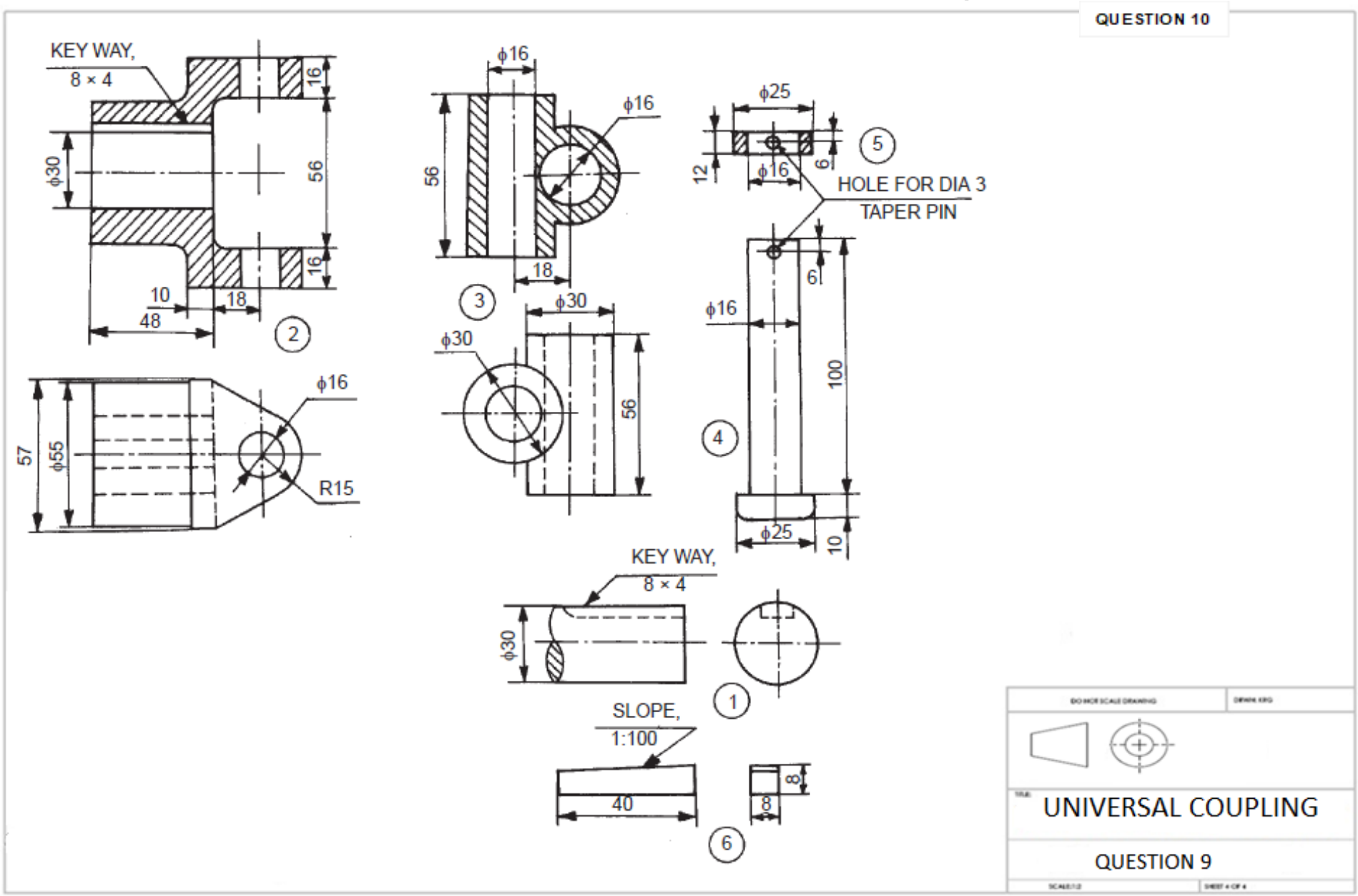

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SHEET 07

AME4065	Part No.	Student No.	QUESTION 08
Title:			
Projection			
Specification/Other Information			

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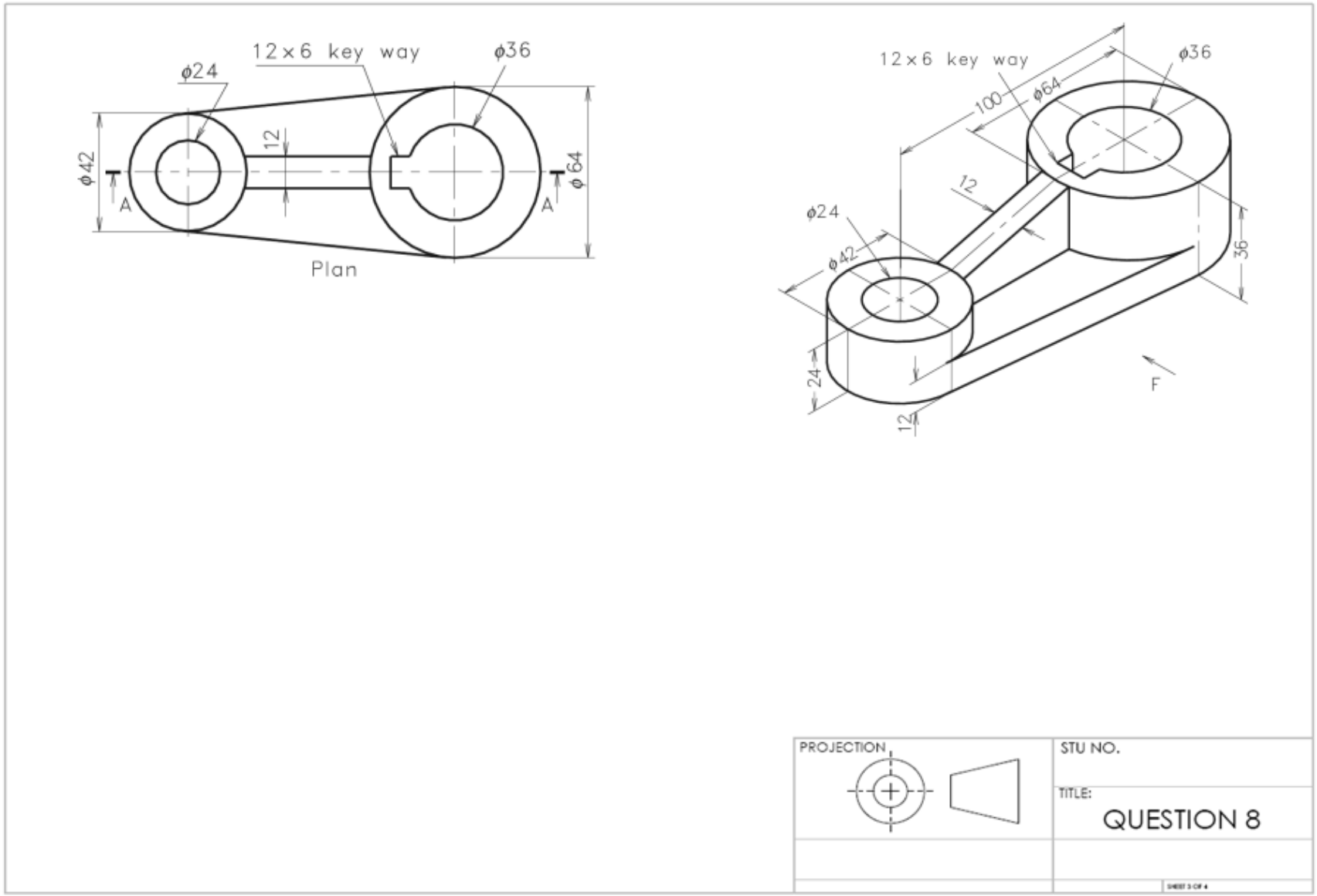

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SHEET 09

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ISO Tolerances for Holes (ISO 286-2)																				
Nominal hole sizes (mm)																				
over	3	6	10	18	30	40	50	65	80	100	120	140	160	180	200	225	250	280	315	355
inc.	6	10	18	30	40	50	65	80	100	120	140	160	180	200	225	250	280	315	355	400
micrometres																				
E6	+28 +20	+34 +25	+43 +32	+53 +40	+66 +50		+79 + 60		+94 +72		+110 +85			+129 +100			+142 +110		+161 +125	
E7	+32 +20	+40 +25	+50 +32	+61 +40	+75 +50		+90 + 60		+107 +72		+125 +85			+146 +100			+162 +110		+185 +125	
E11	+95 +20	+115 +25	+142 +32	+170 +40	+210 +50		+250 + 60		+292 +72		+335 +85			+390 +100			+430 +110		+485 +125	
E12	+140 +20	+175 +25	+212 +32	+250 +40	+300 +50		+360 + 60		+422 +72		+485 +85			+560 +100			+630 +110		+695 +125	
E13	+200 +20	+245 +25	+302 +32	+370 +40	+440 +50		+520 + 60		+612 +72		+715 +85			+820 +100			+920 +110		+1 015 +125	
F6	+18 +10	+22 +13	+27 +16	+33 +20	+41 +2		+49 + 30		+58 +36		+68 43			+79 +50			+88 +56		+98 +62	
F7	+22 +10	+28 +13	+34 +16	+41 +20	+50 +25		+60 + 30		+71 +36		+83 43			+96 +50			+108 +56		+119 +62	
F8	+28 +10	+35 +13	+43 +16	+53 +20	+64 +25		+76 + 30		+90 +36		+106 43			+122 +50			+137 +56		+151 +62	
G6	+12 +4	+14 +5	+17 +6	+20 +7	+25 +9		+29 +10		+34 + 12		+39 +14			+44 +15			+49 +17		+54 +18	
G7	+16 +4	+20 +5	+24 +6	+28 +7	+34 +9		+40 +10		+47 + 12		+54 +14			+61 +15			+69 +17		+75 +18	
G8	+22 +4	+27 +5	+33 +6	+40 +7	+48 +9		+56 +10		+66 + 12		+77 +14			+87 +15			+98 +17		+107 +18	
H6	+8 0	+9 0	+11 0	+13 0	+16 0		+19 0		+22 0		+25 0			+29 0			+32 0		+36 0	
H7	+12 0	+15 0	+18 0	+21 0	+25 0		+30 0		+35 0		+40 0			+46 0			+52 0		+57 0	
H8	+18 0	+22 0	+27 0	+33 0	+39 0		+46 0		+54 0		+63 0			+72 0			+81 0		+89 0	
H9	+30 0	+36 0	+43 0	+52 0	+62 0		+74 0		+87 0		+100 0			+115 0			+130 0		+140 0	
H10	+48 0	+58 0	+70 0	+84 0	+100 0		+120 0		+140 0		+160 0			+185 0			+210 0		+230 0	
H11	+75 0	+90 0	+110 0	+130 0	+160 0		+190 0		+220 0		+250 0			+290 0			+320 0		+360 0	
J6	+5 -3	+5 -4	+6 -5	+8 -5	+10 -6		+13 -6		+16 -6		+18 -7			+22 -7			+25 -7		+29 -7	
J7	+6 -6	+8 -7	+10 -8	+12 -9	+14 -11		+18 -12		+22 -13		+26 -14			+30 -16			+36 -16		+39 -18	
J8	+10 -8	+12 -10	+15 -12	+20 -13	+24 -15		+28 -18		+34 -20		+41 -22			+47 -25			+55 -26		+60 -29	
JS6	+4 -4	+4.5 -4.5	+5.5 -5.5	+6.5 -6.5	+8 -8		+9.5 -9.5		+11 -11		+12.5 -12.5			+14.5 -14.5			+16 -16		+18 -18	

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JS7	+6 -6	+7.5 -7.5	+9 -9	+10.5 -10.5	+12.5 -12.5	+15 -15		+17.5 -17.5		+20 -20			+23 -23			+26 -26		+28.5 -28.5		
JS8	+9 -9	+11 -11	+13.5 -13.5	+16.5 -16.5	+19.5 -19.5	+23 -23		+27 -27		+31.5 -31.5			+36 -36			+40.5 -40.5		+44.5 -44.5		
K6	+2 -6	+2 -7	+2 -9	+2 -11	+3 -13	+4 -15		+4 -18		+4 -21			+5 -24			+5 -27		+7 -29		
K7	+3 -9	+5 -10	+6 -12	+6 -15	+7 -18	+9 -21		+10 -25		+12 -28			+13 -33			+16 -36		+17 -40		
K8	+5 -13	+6 -16	+8 -19	+10 -23	+12 -27	+14 -32		+16 -38		+20 -43			+22 -50			+25 -56		+28 -61		
M6	-1 -9	-3 -12	-4 -15	-4 -17	-4 -20	-5 -24		-6 -28		-8 -33			-8 -37			-9 -41		-10 -46		
M7	0 -12	0 -15	0 -18	0 -21	0 -25	0 -30		0 -35		0 -40			0 -46			0 -52		0 -57		
M8	+2 -16	+1 -21	+2 -25	+4 -29	+5 -34	+5 -41		+6 -48		+8 -55			+9 -63			+9 -72		+11 -78		
N6	-5 -13	-7 -16	-9 -20	-11 -24	-12 -28	-14 -33		-16 -38		-20 -45			-22 -51			-25 -57		-26 -62		
N7	-4 -16	-4 -19	-5 -23	-7 -28	-8 -33	-9 -39		-10 -45		-12 -52			-14 -60			-14 -66		-16 -73		
N8	-2 -20	-3 -25	-3 -30	-3 -36	-3 -42	-4 -50		-4 -58		-4 -67			-5 -77			-5 -86		-5 -94		
P6	-9 -17	-12 -21	-15 -26	-18 -31	-21 -37	-26 -45		-30 -52		-36 -61			-41 -70			-47 -79		-51 -87		
P7	-8 -20	-9 -24	-11 -29	-14 -35	-17 -42	-21 -51		-24 -59		-28 -68			-33 -79			-36 -88		-41 -98		
P8	-12 -30	-15 -37	-18 -45	-22 -55	-26 -65	-32 -78		-37 -91		-43 -106			-50 -122			-56 -137		-62 -151		
R6	-12 -20	-16 -25	-20 -31	-24 -37	-29 -45	-35 -54	-37 -56	-44 -66	-47 -69	-56 -81	-58 -83	-61 -86	-68 -97	-71 -100	-75 -104	-85 -117	-89 -121	-97 -133	-103 -139		
R7	-11 -23	-13 -28	-16 -34	-20 -41	-25 -50	-30 -60	-32 -62	-38 -73	-41 -76	-48 -88	-50 -90	-53 -93	-60 -106	-63 -109	-67 -113	-74 -126	-78 -130	-87 -144	-93 -150		

ISO Tolerances for Shafts (ISO 286-2)																					
Nominal Shaft Sizes (mm)																					
over	3	6	10	18	30	40	50	65	80	100	120	140	160	180	200	225	250	280	315	355	
inc.	6	10	18	30	40	50	65	80	100	120	140	160	180	200	225	250	280	315	355	400	
micrometres																					
a12	-270 -390	-280 -430	-290 -470	-300 -510	-310 -560	-320 -570	-340 -640	-360 -660	-380 -730	-410 -760	-460 -860	-520 -920	-580 -980	-660 -1120	-740 -1200	-820 -1280	-920 -1440	-1050 -1570	-1200 -1770	-1350 -1920	
d6	-30 -38	-40 -49	-50 -61	-65 -78	-80 -96		-100 -119		-120 -142		-145 -170			-170 -199			-190 -222		-210 -246		
e6	-20 -28	-25 -34	-32 -43	-40 -53	-50 -66		-60 -79		-72 -94		-85 -110			-100 -129			-110 -142		-125 -161		
e13	-20 - 200	-25 - 245	-32 - 302	-40 - 370	-50 -440		-60 -520		-72 -612		-85 -715			-100 -820			-110 -920		-125 -1015		

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f5	-10 -15	-13 -19	-16 -24	-20 -29	-25 -36	-30 -43	-36 -51	-43 -61	-50 -70	-56 -79	-62 -87
f6	-10 -18	-13 -22	-16 -27	-20 -33	-25 -41	-30 -49	-36 -58	-43 -68	-50 -79	-56 -88	-62 -98
f7	-10 -22	-13 -28	-16 -34	-20 -41	-25 -50	-30 -60	-36 -71	-43 -83	-50 -96	-56 -108	-62 -119
g5	-4 -9	-5 -11	-6 -14	-7 -16	-9 -20	-10 -23	-12 -27	-14 -32	-15 -35	-17 -40	-18 -43
g6	-4 -12	-5 -14	-6 -17	-7 -20	-9 -25	-10 -29	-12 -34	-14 -39	-15 -44	-17 -49	-18 -54
g7	-4 -16	-5 -20	-6 -24	-7 -28	-9 -34	-10 -40	-12 -47	-14 -54	-15 -61	-17 -69	-18 -75
h4	-0 -4	-0 -4	-0 -5	-0 -6	-0 -7	-0 -8	-0 -10	-0 -12	-0 -14	-0 -16	-0 -18
h5	-0 -5	-0 -6	-0 -8	-0 -9	-0 -11	-0 -13	-0 -15	-0 -18	-0 -20	-0 -23	-0 -25
h6	-0 -8	-0 -9	-0 -11	-0 -13	-0 -16	-0 -19	-0 -22	-0 -25	-0 -29	-0 -32	-0 -36
h7	-0 -12	-0 -15	-0 -18	-0 -21	-0 -25	-0 -30	-0 -35	-0 -40	-0 -46	-0 -52	-0 -57
h8	-0 -18	-0 -22	-0 -27	-0 -33	-0 -39	-0 -46	-0 -54	-0 -63	-0 -72	-0 -81	-0 -89
h9	-0 -30	-0 -36	-0 -43	-0 -52	-0 -62	-0 -74	-0 -87	-0 -100	-0 -115	-0 -130	-0 -140
h10	-0 -48	-0 -58	-0 -70	-0 -84	-0 -100	-0 -120	-0 -140	-0 -160	-0 -185	-0 -210	-0 -230
h11	-0 -75	-0 -90	-0 -110	-0 -130	-0 -160	-0 -190	-0 -220	-0 -250	-0 -290	-0 -320	-0 -360
h12	-0 -120	-0 -150	-0 -180	-0 -210	-0 -250	-0 -300	-0 -350	-0 -400	-0 -460	-0 -520	-0 -570
j5	+3 -2	+4 -2	+5 -3	+5 -4	+6 -5	+6 -7	+6 -9	+7 -11	+7 -13	+7 -16	+7 -18
j6	+6 -2	+7 -2	+8 -3	+9 -4	+11 -5	+12 -7	+13 -9	+14 -11	+16 -13	+16 -16	+18 -18
j7	+8 -4	+10 -5	+12 -6	+13 -8	+15 -10	+18 -12	+20 -15	+22 -18	+25 -21	+26 -26	+29 -28
js5	+2.5 -2.5	+3 -3	+4 -4	+4.5 -4.5	+5.5 -5.5	+6.5 -6.5	+7.5 -7.5	+9 -9	+10 -10	+11.5 -11.5	+12.5 -12.5
js6	+4 -4	+4.5 -4.5	+5.5 -5.5	+6.5 -6.5	+8 -8	+9.5 -9.5	+11 -11	+12.5 -12.5	+14.5 -14.5	+16 -16	+18 -18
js7	+6 -6	+7.5 -7.5	+9 -9	+10.5 -10.5	+12.5 -12.5	+15 -15	+17.5 -17.5	+20 -20	+23 -23	+26 -26	+28.5 -28.5
k5	+6 +1	+7 +1	+9 +1	+11 +2	+13 +2	+15 +2	+18 +3	+21 +3	+24 +4	+27 +4	+29 +4
k6	+9 +1	+10 +1	+12 +1	+15 +2	+18 +2	+21 +2	+25 +3	+28 +3	+33 +4	+36 +4	+40 +4
k7	+13 +1	+16 +1	+19 +1	+23 +2	+27 +2	+32 +2	+38 +3	+43 +3	+50 +4	+56 +4	+61 +4
m5	+9 +4	+12 +6	+15 +7	+17 +8	+20 +9	+24 +11	+28 +13	+33 +15	+37 +17	+43 +20	+46 +21
m6	+12 +4	+15 +6	+18 +7	+21 +8	+25 +9	+30 +11	+35 +13	+40 +15	+46 +17	+52 +20	+57 +21
m7	+16 +4	+21 +6	+25 +7	+29 +8	+34 +9	+41 +11	+48 +13	+55 +15	+63 +17	+72 +20	+78 +21
n5	+13 +8	+16 +10	+20 +12	+24 +15	+28 +17	+33 +20	+38 +23	+45 +27	+51 +31	+57 +34	+62 +37

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n6	+16 +8	+19 +10	+23 +12	+28 +15	+33 +17	+39 +20		+45 +23		+52 +27			+60 +31			+66 +34		+73 +37	
n7	+20 +8	+25 +10	+30 +12	+36 +15	+42 +17	+50 +20		+58 +23		+67 +27			+77 +31			+86 +34		+94 +37	
p5	+17 +12	+21 +15	+26 +18	+31 +22	+37 +26	+45 +32		+52 +37		+61 +43			+70 +50			+79 +56		+87 +62	
p6	+20 +12	+24 +15	+29 +18	+35 +22	+42 +26	+51 +32		+59 +37		+68 +43			+79 +50			+88 +56		+98 +62	
r6	+23 +15	+28 +19	+34 +23	+41 +28	+50 +34	+60 +41	+62 +43	+73 +51	+76 +54	+88 +63	+90 +65	+93 +68	+106 +77	+109 +80	+113 +84	+126 +94	+130 +98	+144 +108	+150 +114

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