UNIVERSITY OF BOLTON

OFF CAMPUS DIVISION

WESTERN INTERNATIONAL COLLEGE FZE

BENG (HONS) MECHANICAL ENGINEERING

SEMESTER ONE EXAMINATION 2023/24

GRAPHICAL COMMUNICATION & COMPUTER MODELLING

MODULE NO: AME4065

Date: Saturday 06 January 2024 **Time: 10:00am – 12:00pm**

ASSESSMENT: **This assessment represents 40% of the total assessment mark for Graphical Communications & Computer Modelling.**

INSTRUCTIONS TO CANDIDATES: **Complete the following questions using a pencil for diagrams and pen for written answers. Write your student number, course and today's date above.**

The marks for each question are shown. The total number of marks available is 90. 10 marks of which are allocated for overall neatness, clarity and the use of standard lines.

If you are unsure of what to do, ask your tutor. Separate the sheets if necessary but replace them in order at the end of the exam.

BS EN 20286-2 Tolerance Tables are included in this exam paper from page 11 to 14.

You have TWO hours to complete the test

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

Question 1

Write the full form of the following Standard Drawing abbreviation seen on engineering drawings:

- NTS ……..
- RD HD ……..
- SPEC ……..

(1 mark each)

(Total 3 Marks)

Question 2

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

- SCREW ……
- ROUND HEAD ……
- CHAMFER ……

(1 mark each)

(Total 3 Marks)

Question 3

Using the partially completed figures (a,b,c) below, sketch the standard representation for the following features which might appear on an engineering drawing:

- Instrument screw:

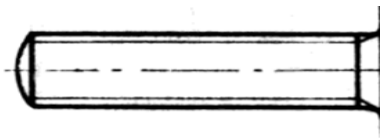


Figure 3 (a)

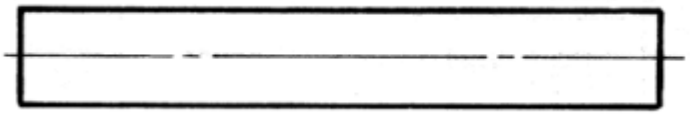
(3 marks)

Question 3 continued over…
Please turn the page

PAST EXAMINATION

Question 3 continued…

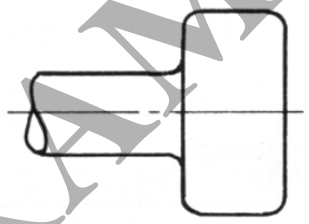
- Hexagonal headed bolt:



(3 marks)

Figure 3 (b)

A Straight Knurl



(3 marks)

Figure 3(c)

Question 4

Drawn below is a cross-section through a Shaft, Bush Bearing and Housing arrangement. The Shaft is a Press fit in the Bush Bearing and the Bush Bearing is a Roll fit in the housing.

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

Question 4 continued…

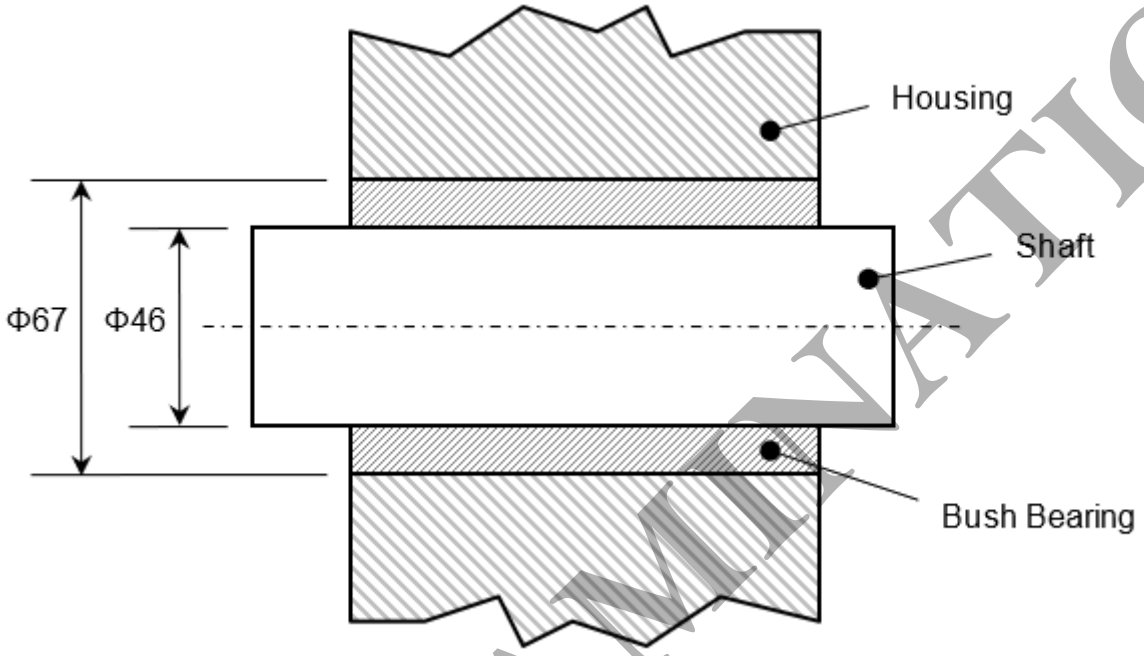


Figure 4(a)

PAST EXAMINATION

Question 4 continued over…
Please turn the page

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

Question 4 continued…

Using BS EN 20286-2 Tolerance Tables (supplied), complete the following table:

Between Components	Grade of Tolerance	Type of Fit	Limits of Size for:	Size of Tolerance
Bush/Shaft	H6 N5		Bush	
			Shaft	
Housing/Bush	H8 F7		Housing	
			Bush	

(12 marks)

Question 5

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

a.  ……

……

Question 5 continued over…
Please turn the page

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

Question 5 continued…

b. ⌒ ……

……

c. ∥ ……

……

(3 marks each)

(Total 9 Marks)

Question 6

State the meaning of the following Geometrical Tolerance statement/s as seen on an engineering drawing (the drawing is in mm):

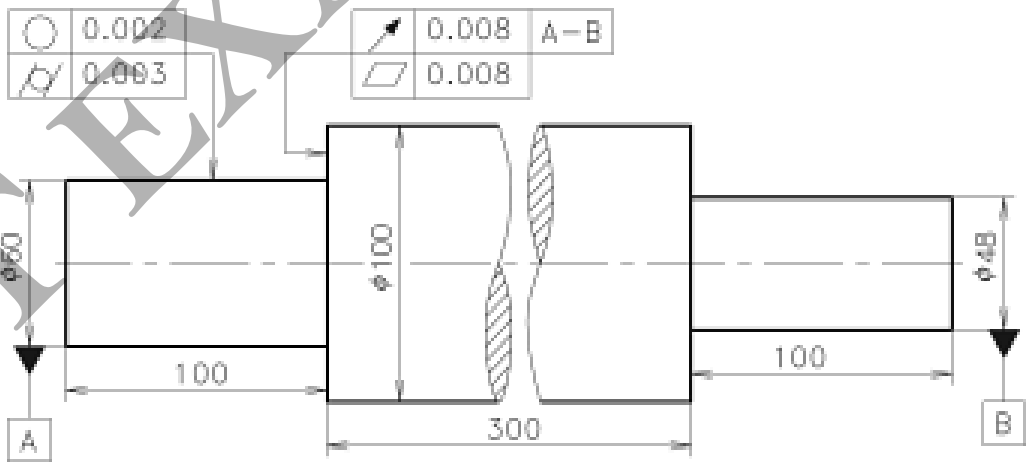


Figure Shaft with bearing surface.

Figure 6(a)

Question 6 continued over…
Please turn the page

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

Question 6 continued…

……
……
……
……
……
……
……
……
……
……
……
……

(Total 8 marks)

Question 7

Shown below is an Isometric View of a machine component showing the outlines and hidden edges.

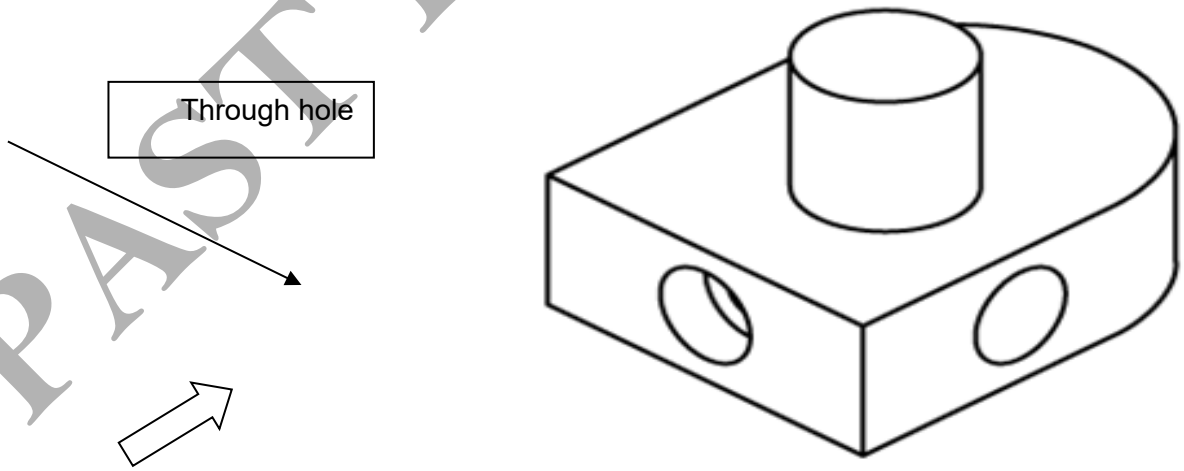


Figure 7(a)

Question 7 continued over…
Please turn the page

PAST EXAMINATION

Question 7 continued…

In **SHEET Q7**, complete the elevation and plan of the given block in 3rd Angle Projection with the arrowhead in given view facing the front. Draw all outlines and hidden detail on each view.

Print your student number and the Projection Symbol in the title block.

(12 marks)

Question 8

SHEET Q8 shows a partially completed Orthographic drawing of a section. The Plan View is already drawn with the arrowhead in given view facing the front and the Section View is missing.

The section plane Y-Y is given in the Top view.

Sketch in 3rd Angle Projection, the Sectional Elevation of the given drawing with the right hand in section**.** The overall dimensions are given in the isometric view.
Supply all sectioning information as necessary. Put your student number in the title block.

(14 marks)

Question 9

Shown below is the **'Plummer Block'** drawing on **page 7**, the components that make up a Plummer Block. Each part is dimensioned appropriately with two views for reference. (The drawing is in mm):
Use a pencil and setsquares; draw an assembly drawing in **SHEET Q9**. Show all the parts assembled in their correct positions and hatched according to drawing conventions.

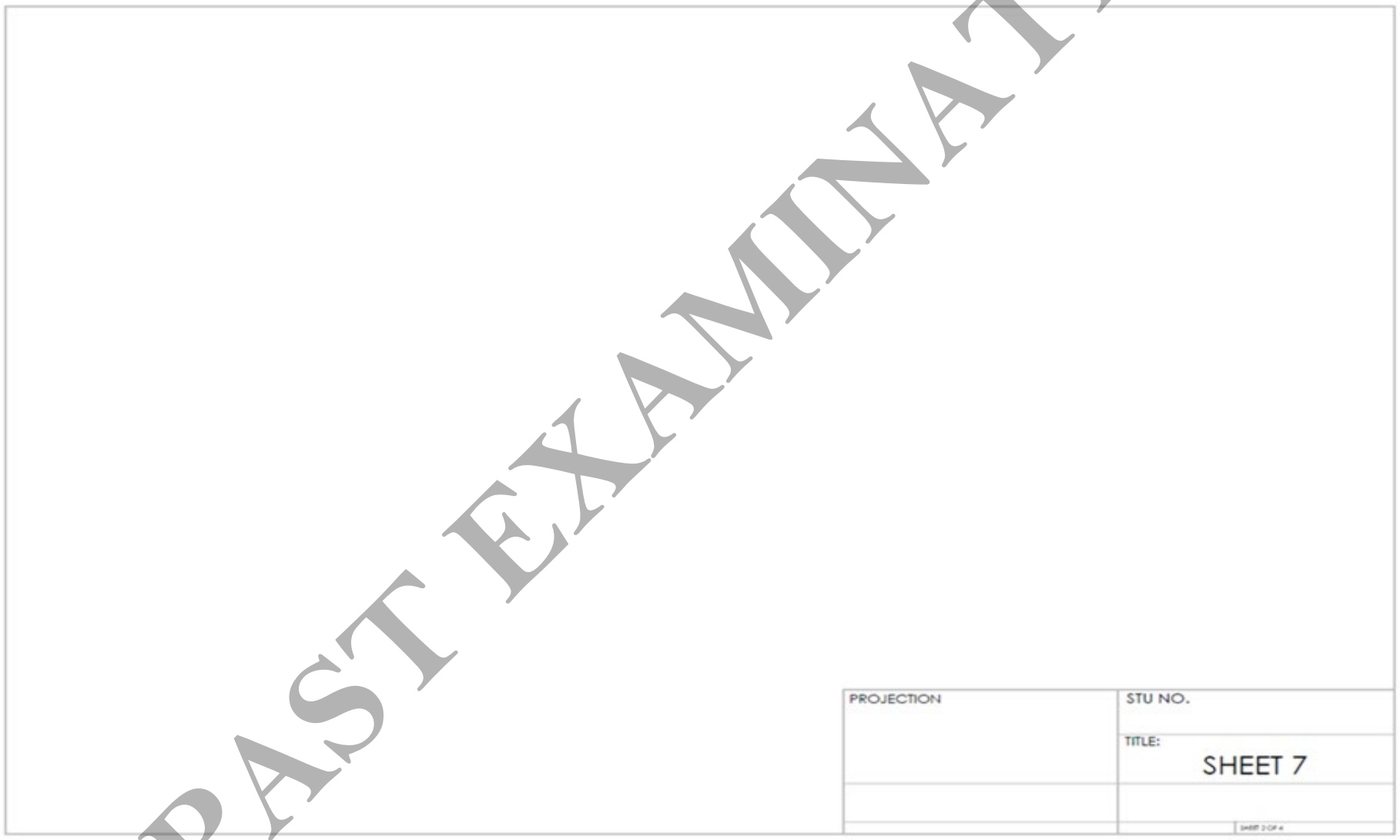
a.	Complete Front View in good proportion	(10 marks)
b.	Sectioning of the assembly drawing	(4 marks)
c.	Balloon reference the assembly	(2 marks)
d.	Create Part list of the assembly	(4 marks)
		(Total 20 Marks)

END OF QUESTIONS
Please turn the page

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

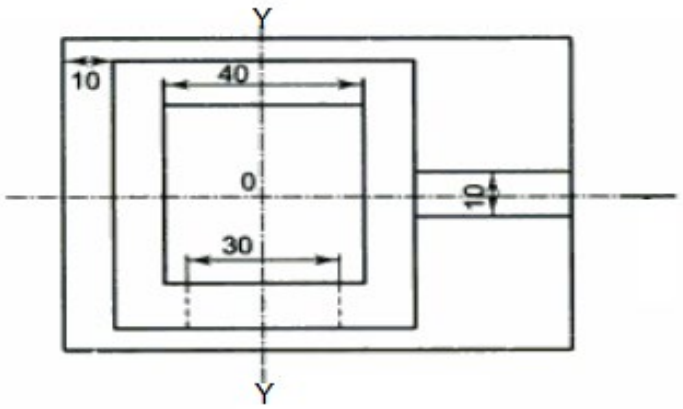
SHEET Q7

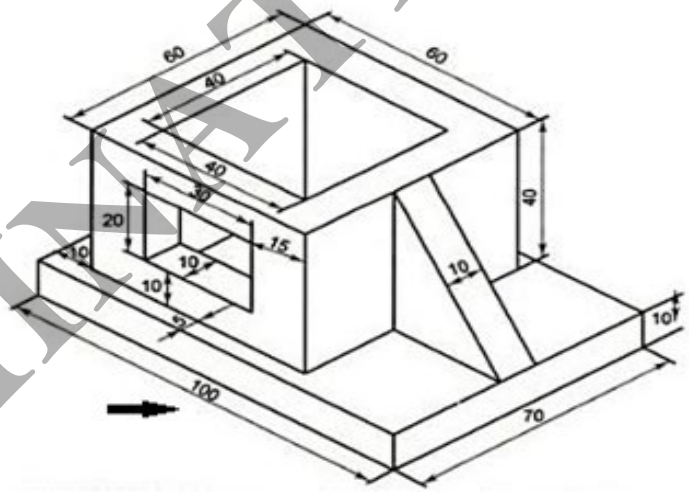


PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

SHEET Q8





PROJECTION

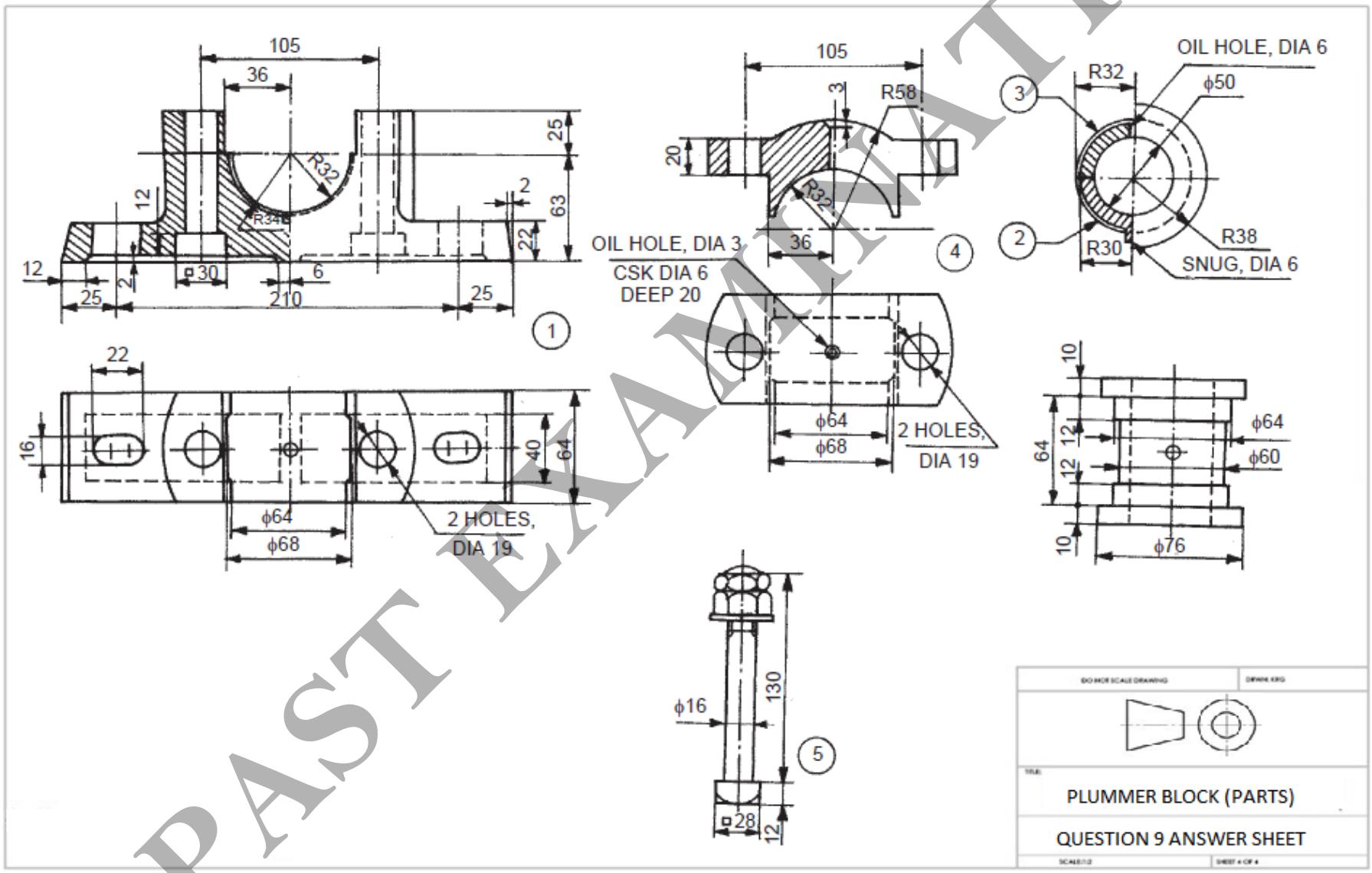
STU NO.

TITLE:

QUESTION 8

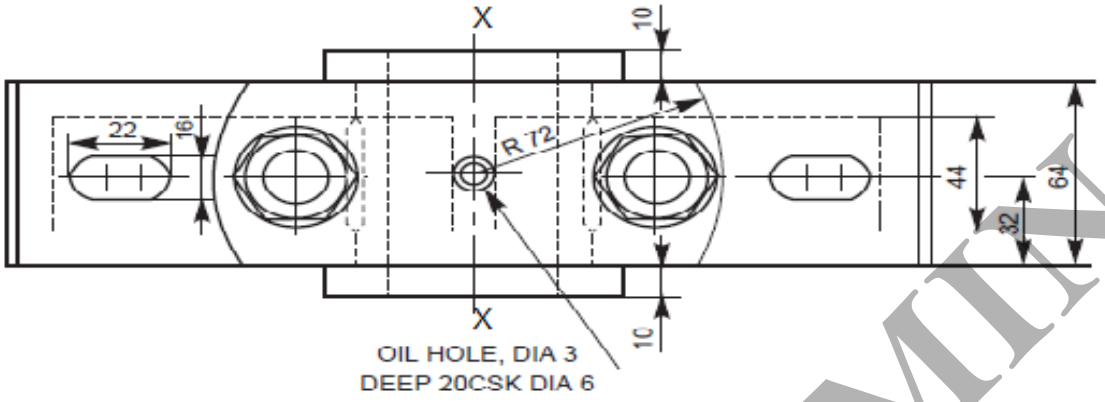
PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065
Sheet Q9



PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065
Sheet Q9



PLUMMER BLOCK ASSEMBLY

QUESTION 9

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

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				
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				

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

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	
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	

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

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
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

PAST EXAMINATION

University of Bolton
Off Campus Division, Western International College
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2023/24
Graphical Communication & Computer Modelling
Module No: AME4065

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

PAST EXAMINATION

END OF PAPER