UNIVERSITY OF BOLTON

WESTERN INTERNATIONAL COLLEGE FZE

BENG (HONS) MECHANICAL ENGINEERING

SEMESTER ONE EXAMINATION 2018/2019

GRAPHICAL COMMUNICATION & COMPUTER MODELLING

MODULE NO: AME4065

Date: Tuesday 8th January 2019 **Time: 2:00pm - 4:00pm**

ASSESSMENT: This assessment represents 45% 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 name, 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. You have 2. hours to complete the test

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1	2	3	4	5	6	7	8	9	Neat	Total
3	3	9	12	9	8	12	14	20	10	

Student Number: …….

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

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

- SPEC ……..
- MATL ……..
- TPI ……..

(3 marks)

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

- Hexagon Head …….
- Pitch Circle Diameter …….
- Center Line …….

(3 marks)

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

- Straight Knurl:

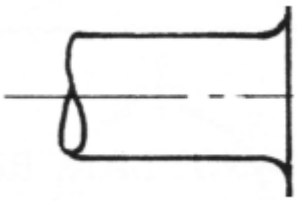
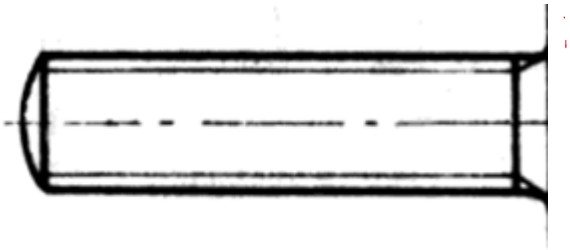


Figure 3 (a) (3 marks)

- Hexagonal headed screw:



(3 marks)

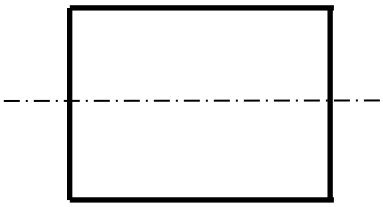
Figure 3 (b)

Question 3 Continues over the page
Please turn the page

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

Question 3 Continued.

- A Square end on a shaft



(3 marks)

Figure 3(c)

Total 9 Marks

4. Drawn below in figure 4(a) is a cross-section through a Shaft, Bush Bearing and Housing arrangement. The Shaft is a 'close running' fit in the Bush Bearing and the Bush Bearing is a 'press fit' in the housing.

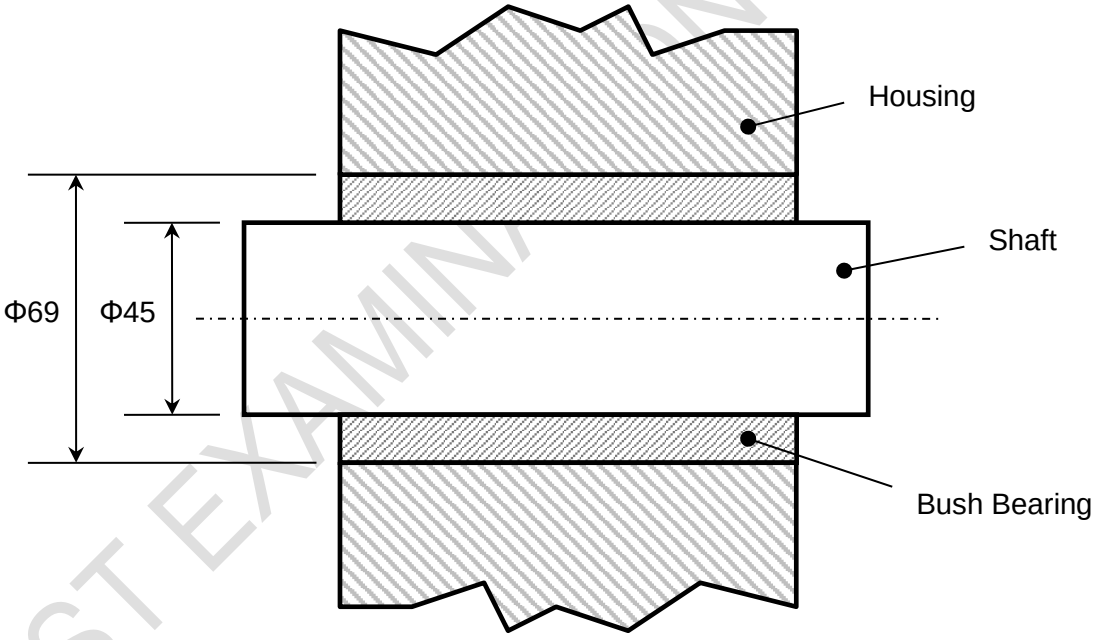


Figure 4(a)

Question 4 Continues over the page

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
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	H7 g6		Bush	
			Shaft	
Housing/Bush	H7p6		Housing	
			Bush	

(12 marks)

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

a.  ……

……
(3 marks)

b.  ……

……
(3 marks)

Question 5 Continues over the page

Please turn the page

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

Question 5 Continued.

c. ⊥ ……..

……

(3 marks)

Total 9 Marks

6. State the meaning of the following Geometrical Tolerance statement/s as seen on an engineering drawing in figure 6(a) below (All dimensions are in mm):

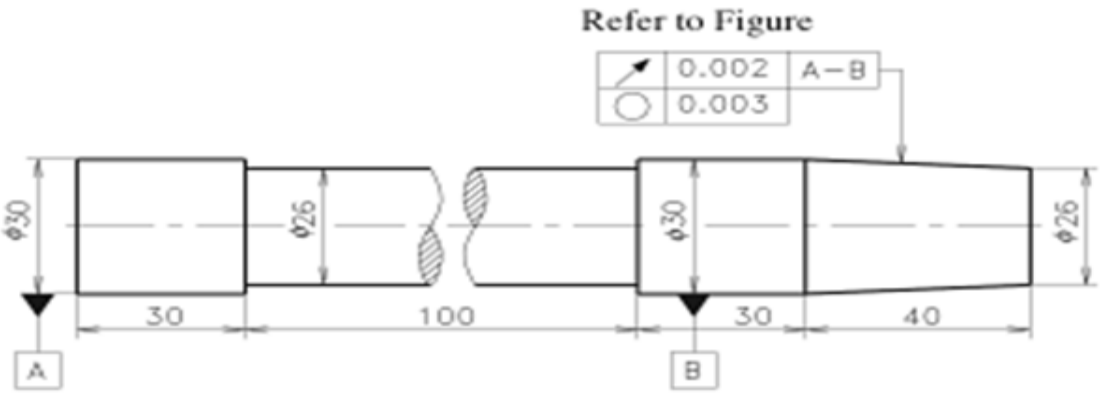


Figure 6(a) Grinder spindle

……
……
……
……
……
……
……
……
……
……
…….. (8 Marks)

Please turn the page

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

7. An isometric drawing of a part is given below in **Figure 7**. The drawing is not to the scale. Use front view (F.V.) shown below with an arrow for drawing reference.

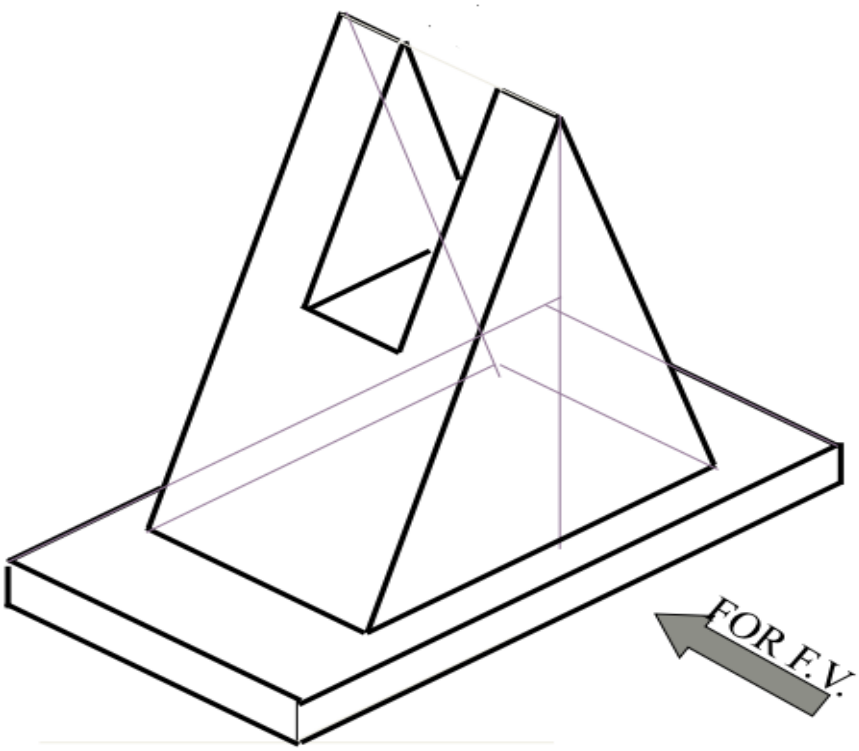


Figure 7

Sketch in 1st Angle Projection, the Elevation and Plan view of the given drawing in SHEET Q7 with proper projection symbol and student number in title block.

a) Elevation View (8 marks)
b) Plan View (4 marks)
c) Student number and Projection symbol (2 marks)

Total 14 Marks

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

8. SHEET Q8 shows a partially completed Orthographic drawing section of a Lever. The Plan View is already drawn and the Section View is missing. The cutting plane passes longitudinally through the centre of the web and section plane is given in the Top view of the lever as A-A. The overall dimensions shown are in mm with section line as A-A. Supply all sectioning information as necessary. Put your student number in the title block.

Sketch using 3rd Angle method of Projection the following.

a) Dimensioned Front View (6 marks)
b) Sectioning with the section line A-A (4 marks)
c) Student number and Projection symbol (2 marks)

Total 12 Marks

9. Shown below is the 'Universal Coupling Parts' drawing on page 10, the components that make up a Universal Coupling Assembly. Each part is dimensioned appropriately with two views for reference. (the drawing is in mm):

Using 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.

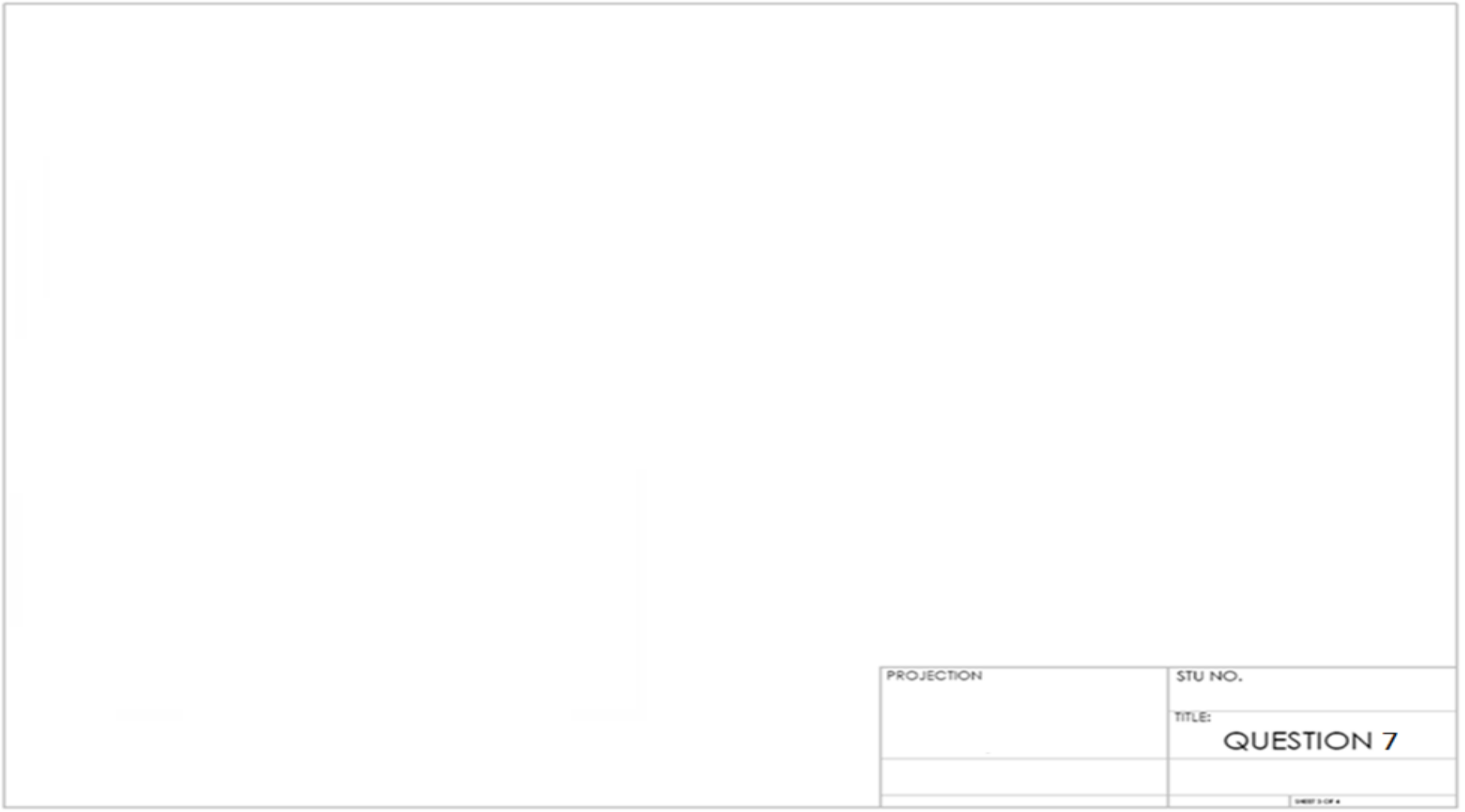
a) Completer Front View in good proportion (10 marks)
b) Sectioning of the assembly drawing (4 marks)
c) Balloon reference the assembly (2 marks)
d) Create Part list of the assembly (4 marks)

Total 20 Marks

END OF QUESTIONS

Please turn the page for supplementary sheets

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065



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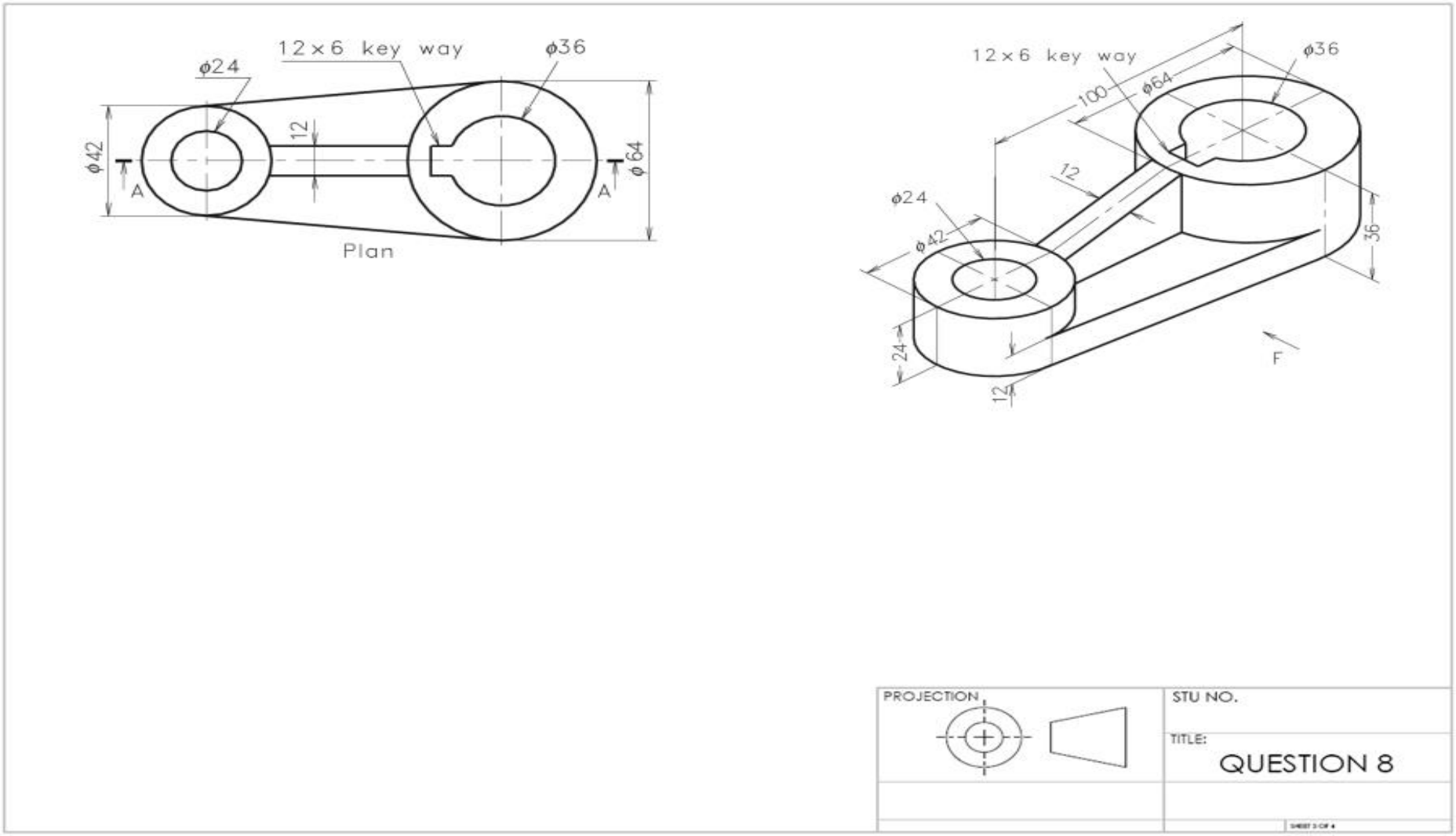
Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065



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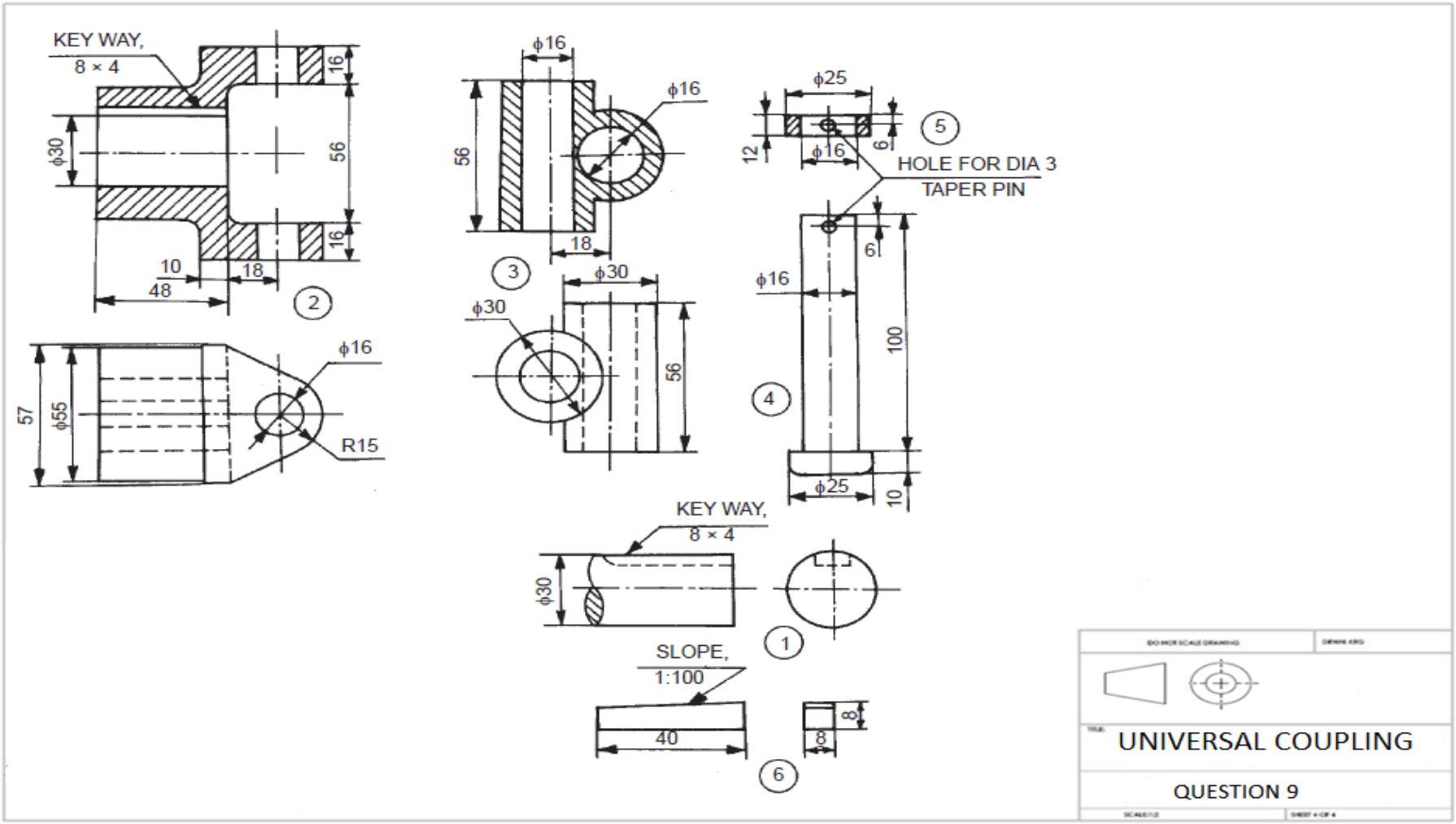
Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065



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Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

Please turn the page

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
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									

Please turn the page

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

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		
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

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

Please turn the page

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	
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	

Western International College FZE
BEng (Hons) Mechanical Engineering
Semester 1 Examination 2018/19
Graphical Communication & Computer Modelling
Module No. AME4065

Please turn the page

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	
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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