

UNIVERSITY OF BOLTON
SCHOOL OF ENGINEERING
B.ENG. AUTOMOTIVE PERFORMANCE ENGINEERING
B.SC. MOTORSPORT TECHNOLOGY
B.ENG. MECHANICAL ENGINEERING
SEMESTER TWO EXAMINATION 2018/2019
GRAPHICAL COMMUNICATIONS AND COMPUTER
MODELLING
MODULE NUMBER AME4065

Date: Thursday 23rd May 2019

Time: 2:00pm – 4:00pm

INSTRUCTIONS TO CANDIDATES

This paper has **FOUR** questions

Answer **ALL FOUR** questions

Each question has a breakdown of marks for each section and a total number of marks per question

There are a total of 49 marks for this exam

Tables and Supplementary sheets for Q3 can be found on pages 8-11

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Question 1

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

- I. BOM
- II. C'BORE
- III. DIM
- IV. PCD

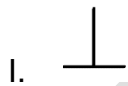
(4 marks)

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

- I. Maximum Material Condition
- II. Auxiliary
- III. Not to Scale
- IV. Outside Diameter

(4 marks)

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



(8 marks)

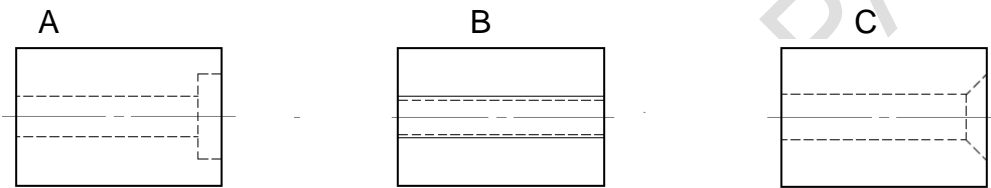
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Total 16 marks
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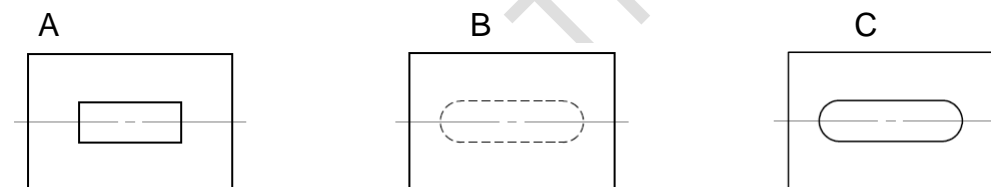
Question 2

a) Consider the drawing views below and state the letter that most appropriately matches the statement:

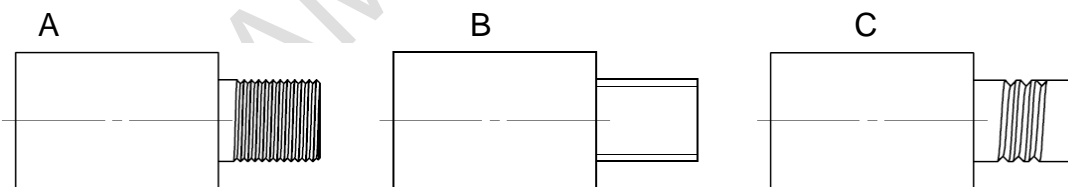
I. A counter-bored through hole:



II. A through slot machined with an end mill:



III. A round bar with an externally threaded boss:



(3 marks)

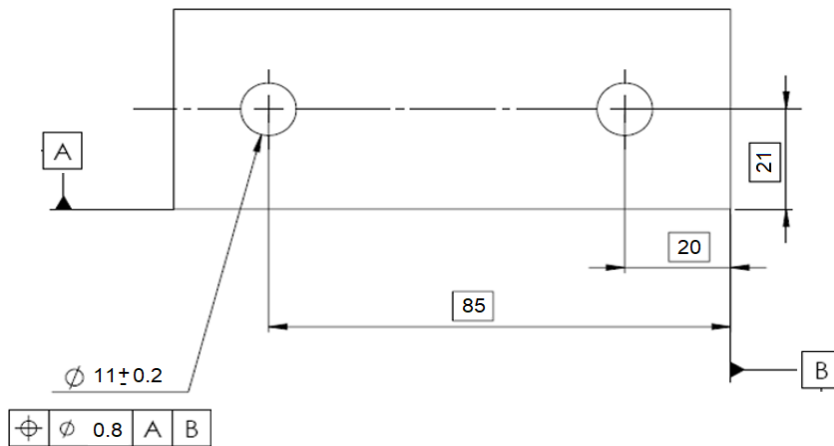
Q2 continues on the following page...

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Q2 continued...

- b) Consider Fig Q2 shown below. Describe using sketches and words:
- I. What the symbols and dimensional information mean
 - II. The significance of the difference between true position and plus / minus coordinate dimensions in the context of this component



(6 marks)

Total 9 marks

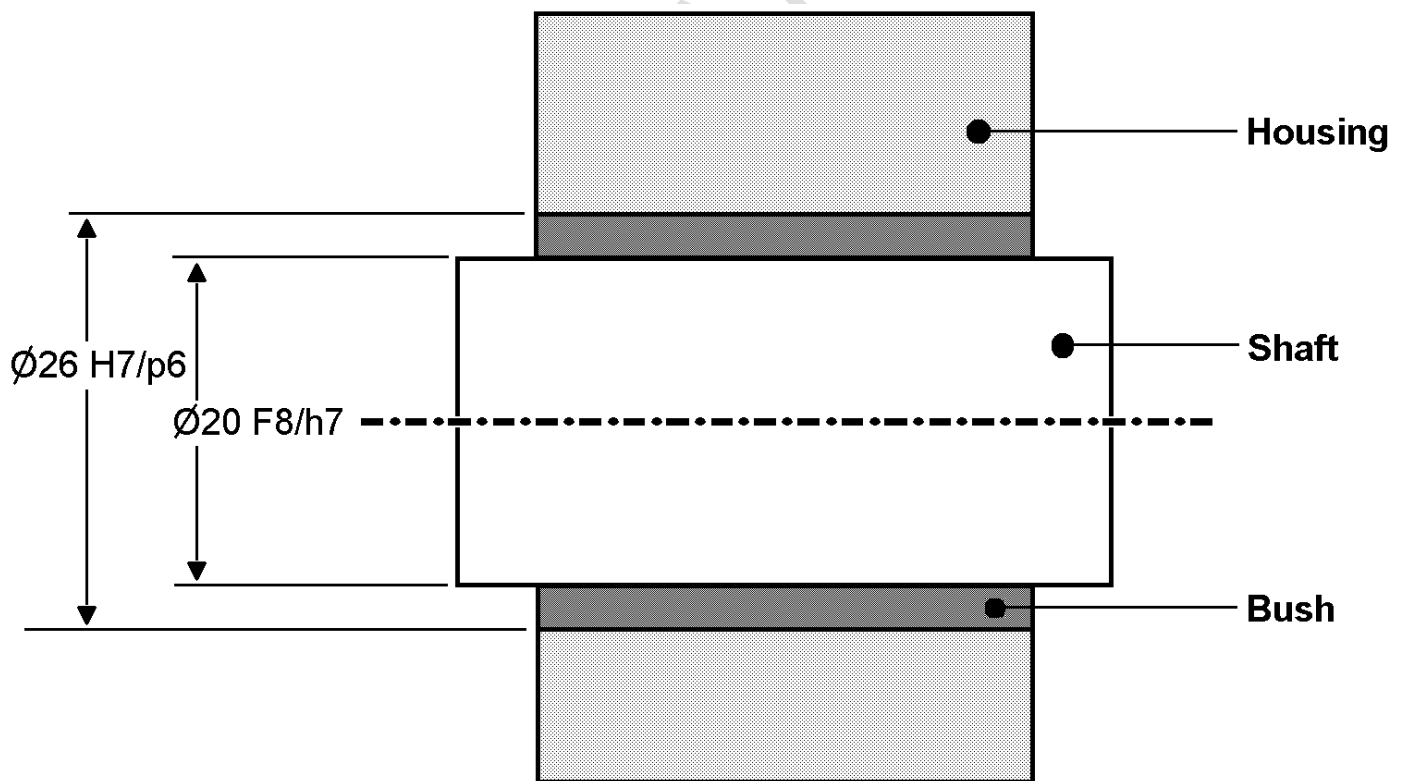
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Question 3

a) Drawn below is a cross-section through a Shaft, Bush Bearing and Housing arrangement. Select fits that allow:

- i) The bush must remain in the Housing
- ii) The shaft must very easily slide in the bush



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b) Using the BS EN 20286-2 Tolerance Tables (supplied), reproduce and complete the table provided on the supplementary sheet Q3.

Total 12 Marks

TABLES CAN BE FOUND ON PAGES 7 - 9

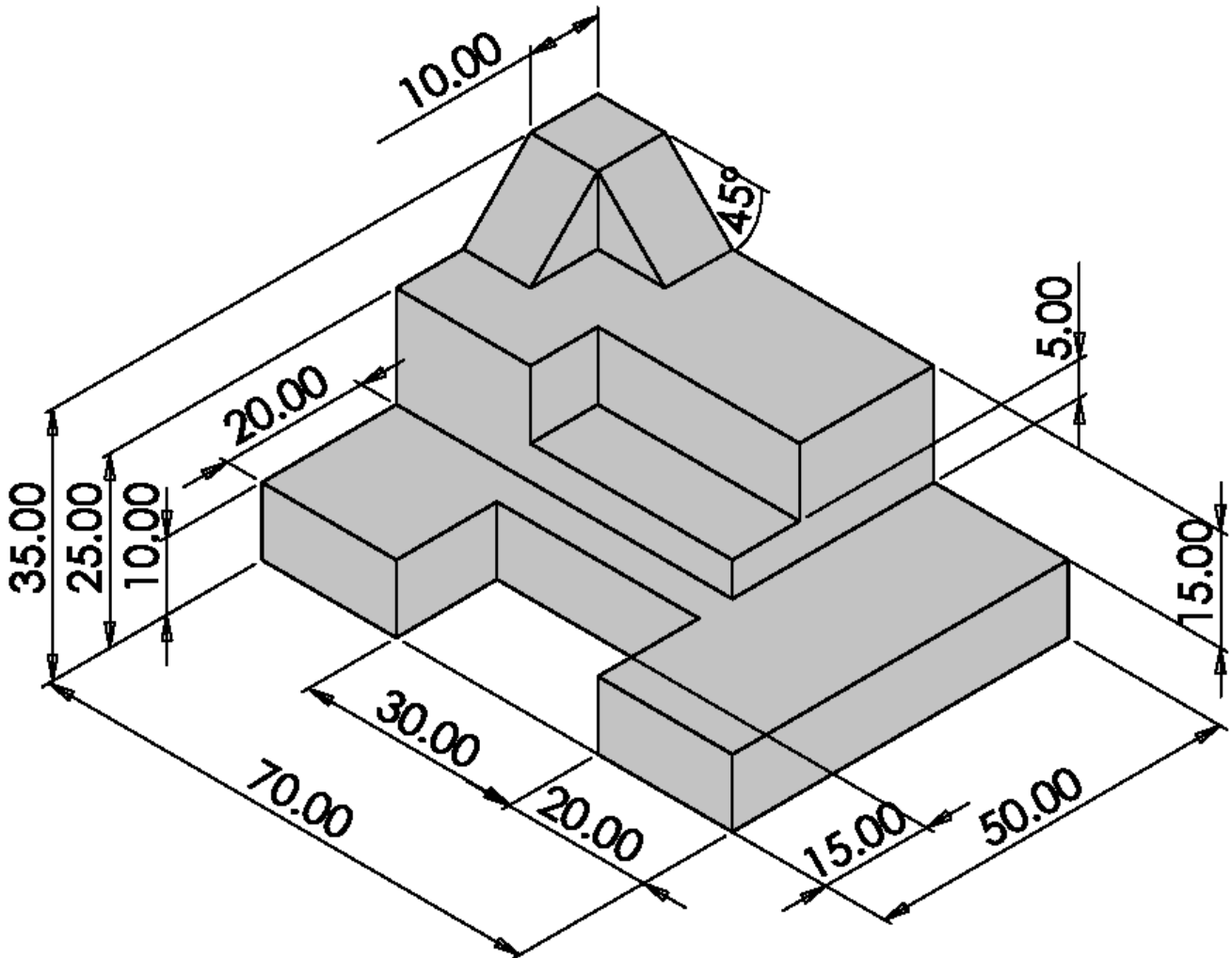
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Question 4

Shown below is an Isometric View of a Block. Hidden edges are not shown. Using 3rd Angle Projection produce 3 views on the drawing layout sheet provided. Dimension each of your views. Print your student number and the Projection Symbol in the title block.



Total 12 Marks

END OF QUESTIONS

PLEASE TURN THE PAGE FOR TABLES TO BE USED FOR QUESTION 3

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Nominal hole sizes (mm)										
Over	3	6	10	18	30	40	50	65	80	100
Including	6	10	18	30	40	50	65	80	100	120
micrometres (10^{-6}m)										
E6	28	34	43	53	66		79		94	
	20	25	32	40	50		60		72	
E7	32	40	50	61	75		90		107	
	20	25	32	40	50		60		72	
E11	95	115	142	170	210		250		292	
	20	25	32	40	50		60		72	
E12	140	175	212	250	300		360		422	
	20	25	32	40	50		60		72	
E13	200	245	302	370	440		520		612	
	20	25	32	40	50		60		72	
F6	18	22	27	33	41		49		58	
	10	13	16	20	25		30		36	
F7	22	28	34	41	50		60		71	
	10	13	16	20	25		30		36	
F8	28	35	43	53	64		76		90	
	10	13	16	20	25		30		36	
G6	12	14	17	20	25		29		34	
	4	5	6	7	9		10		12	
G7	16	20	24	28	34		40		47	
	4	5	6	7	9		10		12	
G8	22	27	33	40	48		56		66	
	4	5	6	7	9		10		12	
H6	8	9	11	13	16		19		22	
	0	0	0	0	0		0		0	
H7	12	15	18	21	25		30		35	
	0	0	0	0	0		0		0	
H8	18	22	27	33	39		46		54	
	0	0	0	0	0		0		0	
H9	30	36	43	52	62		74		87	
	0	0	0	0	0		0		0	
H10	48	58	70	84	100		120		140	
	0	0	0	0	0		0		0	
H11	75	90	110	130	160		190		220	
	0	0	0	0	0		0		0	
J6	5	5	6	8	10		13		16	
	-3	-4	-5	-5	-6		-6		-6	
J7	6	8	10	12	14		18		22	
	-6	-7	-8	-9	-11		-12		-13	

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Nominal Shaft Size (mm)										
Over	3	6	10	18	30	40	50	65	80	100
Including	6	10	18	30	40	50	65	80	100	120
micrometres (10^{-6}m)										
a12	-270	-280	-290	-300	-310	-320	-340	-360	-380	-410
	-390	-430	-470	-510	-560	-570	-640	-660	-730	-760
d6	-30	-40	-50	-65	-80	-100	-120			
	-38	-49	-61	-78	-96	-119	-142			
e6	-20	-25	-32	-40	-50	-60	-72			
	-28	-34	-43	-53	-66	-79	-94			
e13	-220	-270	-334	-410	-50	-60	-72			
					-440	-520	-612			
f5	-25	-32	-40	-49	-25	-30	-36			
					-36	-43	-51			
f6	-10	-13	-16	-20	-25	-30	-36			
	-18	-22	-27	-33	-41	-49	-58			
f7	-10	-13	-16	-20	-25	-30	-36			
	-22	-28	-34	-41	-50	-60	-71			
g5	-4	-5	-6	-7	-9	-10	-12			
	-9	-11	-14	-16	-20	-23	-27			
g6	-4	-5	-6	-7	-9	-10	-12			
	-12	-14	-17	-20	-25	-29	-34			
g7	-4	-5	-6	-7	-9	-10	-12			
	-16	-20	-24	-28	-34	-40	-47			
h4	0	-0	-0	-0	-0	-0	0			
	-4	-4	-5	-6	-7	-8	-10			
h5	0	-0	-0	-0	-0	-0	0			
	-5	-6	-8	-9	-11	-13	-15			
h6	0	0	0	0	-0	-0	0			
	-8	-9	-11	-13	-16	-19	-22			
h7	0	-0	-0	0	-0	-0	0			
	-12	-15	-18	-21	-25	-30	-35			
h8	0	-0	-0	0	-0	-0	0			
	-18	-22	-27	-33	-39	-46	-54			
h9	0	-0	-0	0	-0	-0	0			
	-30	-36	-43	-52	-62	-74	-87			
h10	0	-0	-0	0	-0	-0	0			
	-48	-58	-70	-84	-100	-120	-140			
h11	0	-0	-0	0	-0	-0	0			
	-75	-90	-110	-130	-160	-190	-220			
h12	0	-0	-0	0	-0	-0	0			
	-120	-150	-180	-210	-250	-300	-350			

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Nominal Shaft Size (mm)										
Over	3	6	10	18	30	40	50	65	80	100
Including	6	10	18	30	40	50	65	80	100	120
micrometres (10^{-6}m)										
j5	3	4	5	5	6	6	6			6
	-2	-2	-3	-4	-5	-7	-9			
j6	6	7	8	9	11	12	13			
	-2	-2	-3	-4	-5	-7	-9			
j7	8	10	12	13	15	18	20			
	-4	-5	-6	-8	-10	-12	-15			
js5	2.5	3	4	4.5	5.5	6.5	7.5			
	-2.5	-3	-4	-4.5	-5.5	-6.5	-7.5			
js6	4	4.5	5.5	6.5	8	9.5	11			
	-4	-4.5	-5.5	-6.5	-8	-9.5	-11			
js7	6	7.5	9	10.5	12.5	15	17.5			
	-6	-7.5	-9	-10.5	-12.5	-15	-17.5			
k5	6	7	9	11	13	15	18			
	1	1	1	2	2	2	3			
k6	9	10	12	15	18	21	25			
	1	1	1	2	2	2	3			
k7	13	16	19	23	27	32	38			
	1	1	1	2	2	2	3			
m5	9	12	15	17	20	24	28			
	4	6	7	8	9	11	13			
m6	12	15	18	21	25	30	35			
	4	6	7	8	9	11	13			
m7	16	21	25	29	34	41	48			
	4	6	7	8	9	11	13			
n5	13	16	20	24	28	33	38			
	8	10	12	15	17	20	23			
n6	16	19	23	28	33	39	45			
	8	10	12	15	17	20	23			
n7	20	25	30	36	42	50	58			
	8	10	12	15	17	20	23			
p5	17	21	26	31	37	45	52			
	12	15	18	22	26	32	37			
p6	20	24	29	35	42	51	59			
	12	15	18	22	26	32	37			
r6	23	28	34	41	50	60	62	73	76	
	15	19	23	28	34	41	43	51	54	

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END OF TABLES AND SUPPLMENTARY PAPERS

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Supplementary Sheet Question 3

Between Components	Grade of Tolerance	Type of Fit	Limits of Size for:	Size of Tolerance (mm)
<p>Bush / Shaft</p>	<p>F8 / h7</p>		<p>Bush</p>	
			<p>Shaft</p>	
<p>Housing / Bush</p>	<p>H7 / p6</p>		<p>Housing</p>	
			<p>Bush</p>	

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