



MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF (ELECTRICAL AND ELECTRONICS ENGINEERING)

EEE101 ENGINEERING DRAWING II

DATE: 21/4/2023

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

1. This paper contains FIVE questions.
2. Answer Question **ONE** and any other **TWO** questions
3. Allow 1½ Hours for question 1 and 45 minutes for each of the other two questions.
4. All dimensions are in millimetres unless otherwise stated.
5. Construction lines should be faint and should not be erased.
6. Accuracy and good line work are essential.

QUESTION ONE (COMPULSORY)(30 MARKS)

The part drawings of a Machine Vice are shown in **Figure Q1(a) to (e)**. Assemble the components and draw:

- a) **Sectional view of the assembly**, through the plane X-X as shown in the Figure Q1(a)
- b) **Top and End elevation of the assembly**

Use first angle projection and do not indicate the dimensions and hidden details.

QUESTION TWO (20 MARKS)

Figure Q2 shows a casting. Draw the sectional view, section XX, and the left side view. Front view is as indicated by the arrow. Indicate the dimensions.

QUESTION THREE (20 MARKS)

- (a) Differentiate between clearance fit and transition fit. (2 marks)
- (b) A journal bearing consists of a bronze bush of diameter 130mm fitted into a housing and a steel shaft of 60mm diameter, running in the bush, with oil as a lubricant. Determine the working dimensions of (a) bore of the housing (b) bush and (c) shaft. Calculate the maximum and minimum interference or clearance. Assume interference fit, H7/p6 for the bush and housing and normal running fit, H7/f7 for the shaft and the bush. Refer to Tables 1, 2 and 3. (18 marks)

QUESTION FOUR (20 MARKS)

Illustrate by using example sketches how the following features are represented in Engineering drawing: Housing, bush, boss, curved slot, rib, fillet, key, keyway, slot and flat.

QUESTION FIVE (20 MARKS)

- (a) Draw a double line sketch of an orthographic pipe network of the single line network shown in **Figure Q5 (a)** (14 marks)
- (b) **Figure Q5 (b)** shows Light-sensitive Alarm Project circuit. The circuit detects a sudden shadow falling on the light-sensor and sounds the beeper when this happens. Name **the twelve** devices indicated **1** to **12** in the circuit. (6 marks)

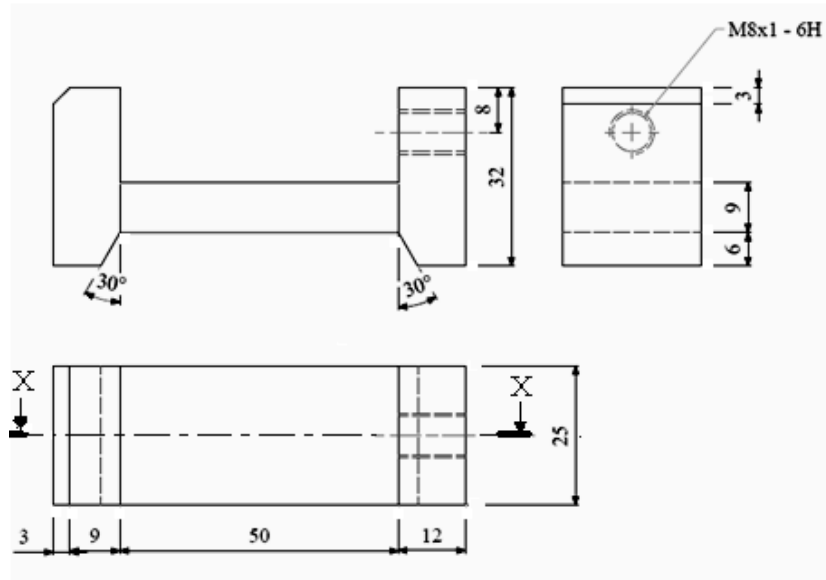


Figure Q1(a) Part 1

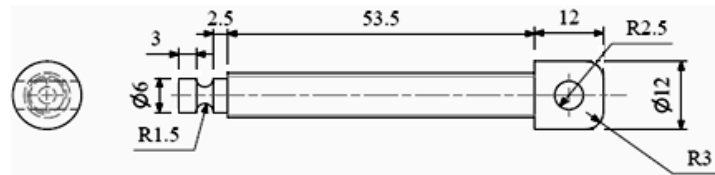


Figure Q1(b) Part 2



Figure Q1(c) Part 3

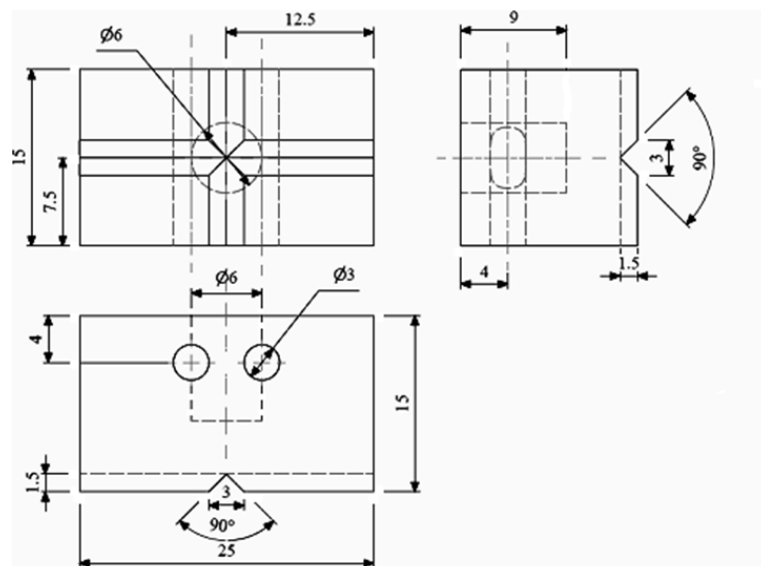


Figure Q1(d) Part 4



Figure Q1(e) Part 5

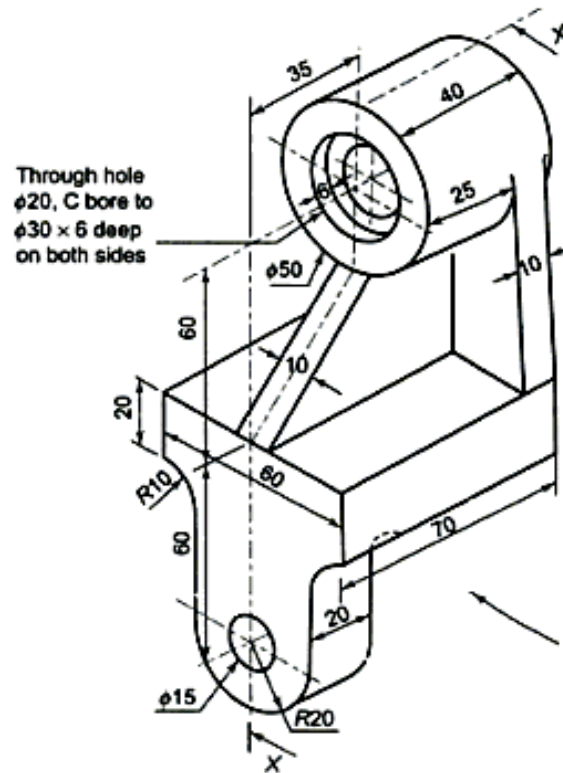


Figure Q2

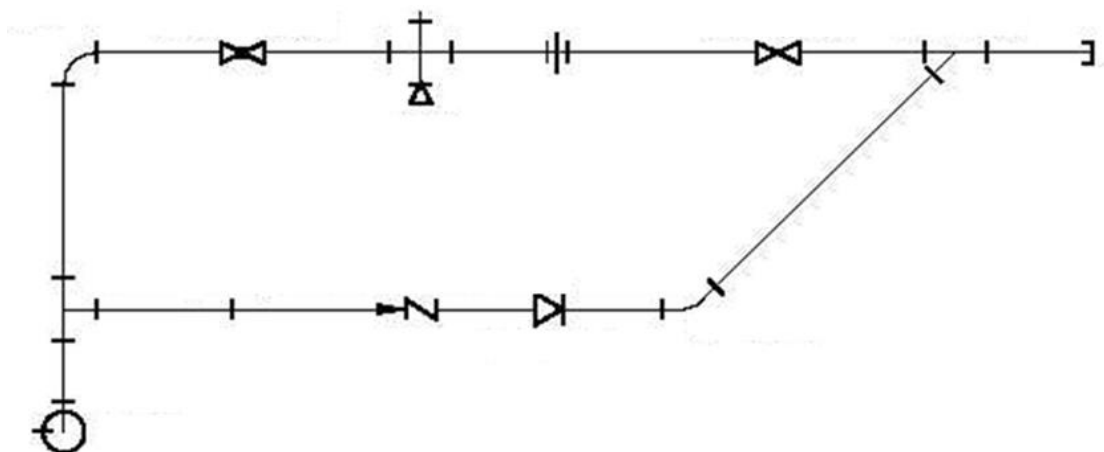


Figure Q5 (a)

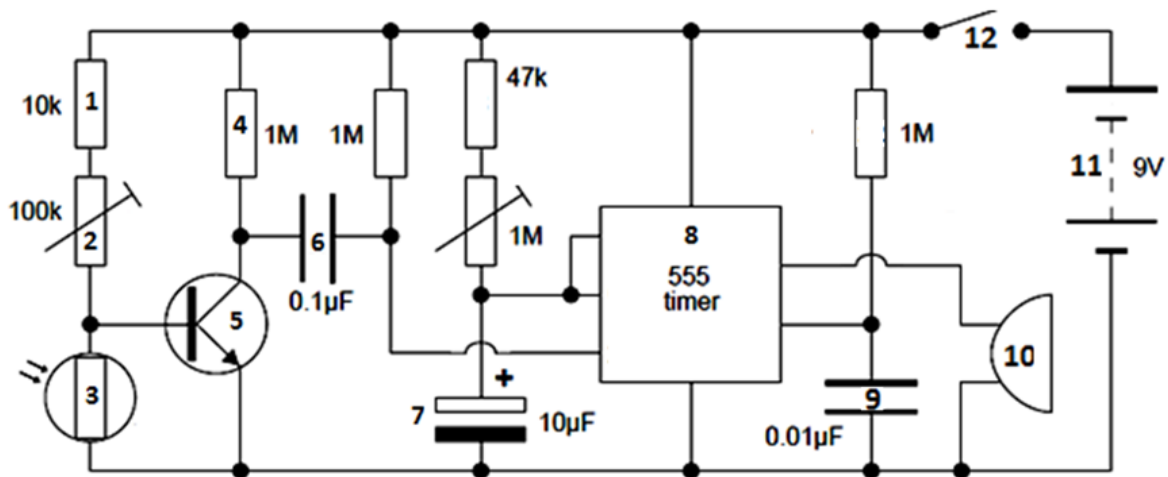


Figure Q5 (b)

Table 1 Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns) (1 micron = 0.001 mm)

Diameter steps in mm	Tolerance Grades																	
	01	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14*	15*	16*
Over 30 To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620	1000	1600
Over 50 To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190	300	460	740	1200	1900
Over 80 To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870	1400	2200
Over 120 To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000	1600	2500

Table 2 Fundamental deviations for shafts of types a to k of sizes upto 500mm (contd.)

Fundamental deviation in microns										(1 micron = 0.001 mm)					
Diameter steps in mm		Upper deviation (<i>es</i>)								js ⁺	Lower deviation (<i>ei</i>)				
		<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>		<i>j</i>			<i>k</i>	
over	upto	All grades								± IT/2	5.6	7	8	4 to 7	≤ 3, > 7
50	65	− 340	− 190	− 140	− 100	− 60	− 30	− 10	0		− 7	− 12	—	+ 2	0
65	80	− 360	− 200	− 150							− 9	− 15	—	+ 3	0
80	100	− 380	− 220	− 170	− 120	− 72	− 36	− 12	0		− 11	− 18	—	+ 3	0
100	120	− 410	− 240	− 180											
120	140	− 460	− 260	− 200	− 145	− 85	− 43	− 14	0						
140	160	− 520	− 280	− 210											
160	180	− 580	− 310	− 230											

Table 2 Fundamental deviations for shafts of types **m** to **zc** of sizes upto 500 mm (*contd.*)

Fundamental deviation in microns															(1 micron = 0.001 mm)		
Diameter steps in mm		Lower deviations (ei)															
		m	n	p	r	s	t	u	v	x	y	z	za	zb	zc		
Over	Upto	All grades															
30	40	+ 9	+ 17	+ 26	+ 34	+ 43	+ 48	+ 60	+ 68	+ 80	+ 94	+ 112	+ 148	+ 200	+ 274		
40	50						+ 54	+ 70	+ 81	+ 97	+ 114	+ 136	+ 180	+ 242	+ 325		
50	65	+ 11	+ 20	+ 32	+ 41	+ 53	+ 66	+ 87	+ 102	+ 122	+ 144	+ 172	+ 226	+ 300	+ 405		
65	80				+ 43	+ 59	+ 75	+ 102	+ 120	+ 146	+ 174	+ 210	+ 274	+ 360	+ 480		
80	100	+ 13	+ 23	+ 37	+ 51	+ 71	+ 91	+ 124	+ 146	+ 178	+ 214	+ 258	+ 335	+ 445	+ 585		
100	120				+ 54	+ 79	+ 104	+ 144	+ 172	+ 210	+ 254	+ 310	+ 400	+ 525	+ 690		
120	140	+ 15	+ 27	+ 43	+ 63	+ 92	+ 122	+ 170	+ 202	+ 248	+ 300	+ 365	+ 470	+ 620	+ 800		
140	160				+ 65	+ 100	+ 134	+ 190	+ 228	+ 280	+ 340	+ 415	+ 535	+ 700	+ 900		
160	180				+ 68	+ 108	+ 146	+ 210	+ 252	+ 310	+ 380	+ 465	+ 600	+ 780	+ 1000		

Table 3 Fundamental deviations for holes of types **A** to **N** for sizes upto 500 mm (*contd.*)

A to N

Fundamental deviation in microns													(1 micron = 0.001 mm)							
Diameter steps in mm		Lower deviations (<i>EI</i>)										Upper deviations (<i>ES</i>)								
		<i>A</i> *	* <i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>Js</i> +	<i>J</i>			<i>K</i>		<i>M</i>		<i>N</i>		
Over	Upto	All grades								± IT/2	6	7	8	≤ 8	> 8	≤ 8 $\frac{1}{2}$	> 8	≤ 8	> 8*	≤ 7
30	40	+ 310	+ 170	+ 120	+ 80	+ 50	+ 25	+ 9	0		+ 10	+ 14	+ 24	- 2 + Δ	—	- 9 + Δ	- 9	- 17 + Δ	0	Same deviation as for grades > 7 + Δ
40	50	+ 320	+ 180	+ 130							+ 13	+ 18	+ 28	- 2 + Δ	—	- 11 + Δ	- 11	- 20 + Δ	0	
50	65	+ 340	+ 190	+ 140							+ 100	+ 60	+ 30	+ 10	0	+ 16	+ 22	+ 34	- 3 + Δ	
65	80	+ 360	+ 200	+ 150	+ 120	+ 72	+ 36	+ 12	0	+ 18	+ 26	+ 41	- 3 + Δ	—	- 15 + Δ	- 15	- 27 + Δ	0		
80	100	+ 380	+ 220	+ 170	+ 145	+ 85	+ 43	+ 14	0		+ 18	+ 26	+ 41	- 3 + Δ	—	- 15 + Δ	- 15	- 27 + Δ	0	
100	120	+ 410	+ 240	+ 180																
120	140	+ 460	+ 260	+ 200																
140	160	+ 520	+ 280	+ 210																
160	180	+ 580	+ 310	+ 230																