

MACHAKOS UNIVERSITY

FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE IN MECHANICAL AND MANUFACTURING ENGINEERING

2018/2019

EMM 101 ENGINEERING DRAWING AND DESIGN II

TIME: 3 HOURS

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 1: Compulsory (30 marks)

The part drawings of a pulley assembly are shown in **Figure Q1, Parts 1 to 5**. The components of the pulley are assembled as shown in **Figure Q1 assembly**. Draw (i) **sectional view** of the assembly from the front elevation through the centre plane of the pulley as shown in **Figure Q1 part 4** and (ii) **end elevation** from the right as indicated in Figure Q1 assembly. Do not indicate the dimensions and hidden details.

Question 2: (20 marks)

Figure Q2 shows a sliding block. Draw the following views using first angle projection (i) the view from the front, (ii) the view from above and (iii) the sectional view from the right through the centre of the block. Front view is as indicated by the arrow.

Question 3: (20 marks)

- a) Calculate the fundamental tolerance for a shaft of 100mm and grade 7. The empirical relation of standard tolerance unit, $i = 0.45 \times \sqrt[3]{D} + 0.001 D$, where D is the geometrical mean of the limiting values of the basic steps. The shaft size of 100mm lies in the basic step, 80 to 120mm. Refer to **Table Q3(i)** and **(ii)**. (3marks)
- b) Illustrate the following methods used in industries for placing limit dimensions or tolerancing individual dimensions by using a sketch.
 - (i) Bilateral tolerance of equal variation
 - (ii) Bilateral tolerance of unequal variation
 - (iii) Unilateral tolerance with zero variation in one direction
 - (iv) Minimum and maximum size directly indicated(8 marks)
- c) Name and Illustrate by using sketches conventional representation of three classes of fits. (9 marks)

Question 4: (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 5: (20 marks)

(a) Draw a double line sketch of an orthographic pipe network of the single line network shown in **Figure Q5 (a)** (13 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. Redraw the circuit given indicating the correct symbols of the devices as given in the list below

(7 marks)

Device Number	Description
1.	10 k Ω resistor
2.	100 k Ω variable resistor
3.	Light Dependant Resistor
4.	1 M Ω resistor
5.	NPN transistor: BC108 (or equivalent)
6.	0.1 μ F Capacitor
7.	1 M Ω resistor
8.	47 k Ω resistor
9.	1 M Ω variable resistor
10.	10 μ F Capacitor
11.	Low-power timer IC
12.	1 M Ω resistor
13.	0.01 μ F capacitor
14.	Beeper 9-12V (Speaker)
15.	9V DC battery
16.	Switch

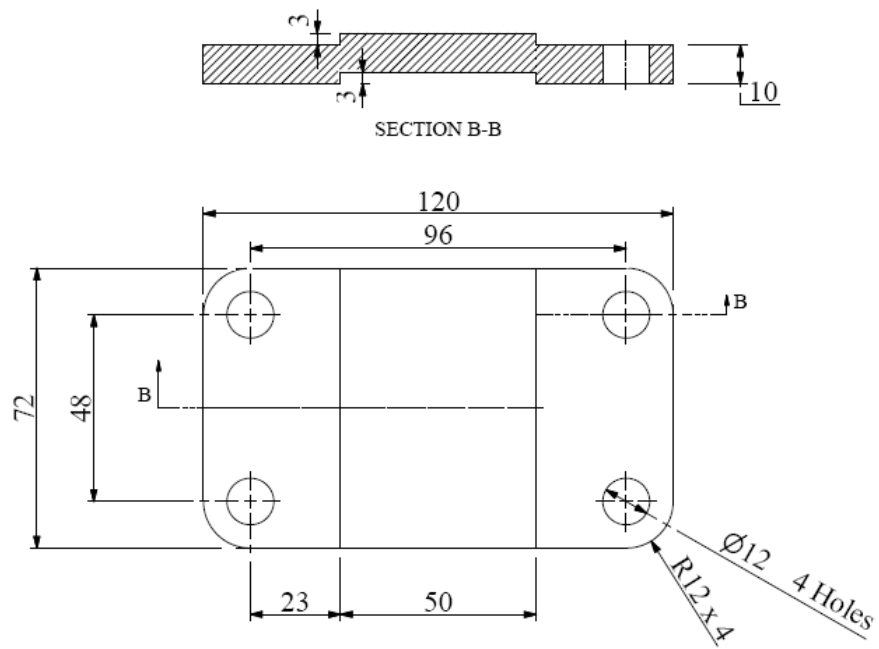


Fig Q1: Part 1

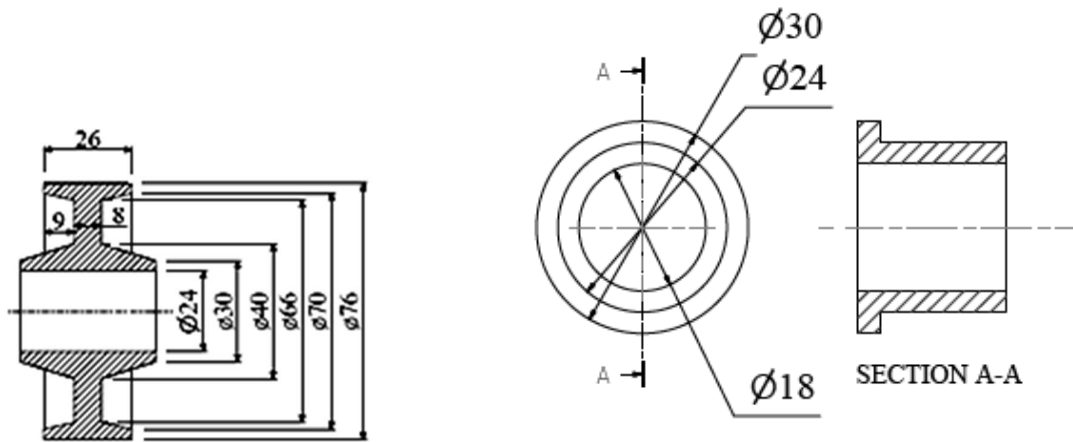


Fig Q1: Part 4

Fig Q1: Part 5

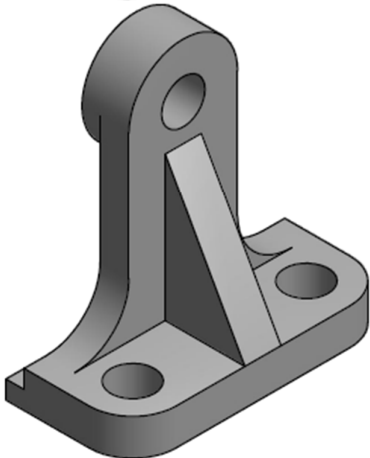


Fig Q1: Part 3

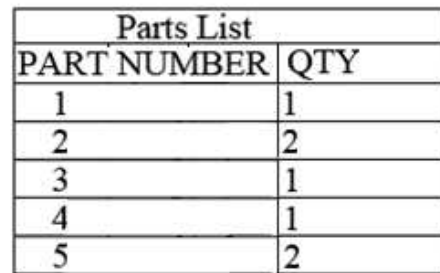


Figure Q2

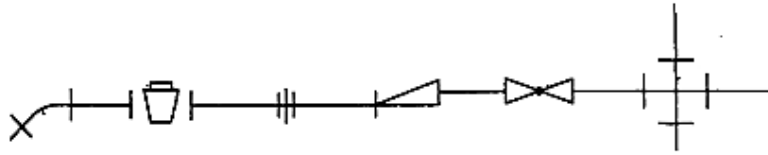


Figure Q5 (a)

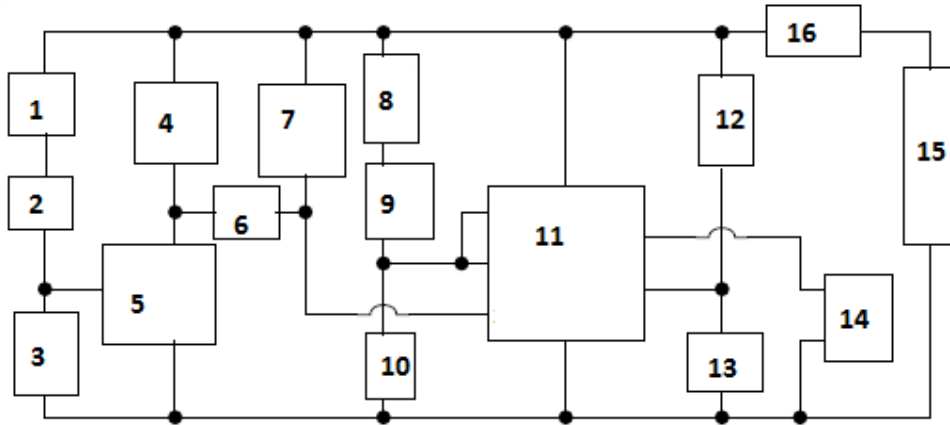


Figure Q5 (b)

Table Q3(i). Relative magnitude of IT tolerances for grades 5 to 16 in terms of tolerance unit i for sizes upto 500 mm

Grade	$IT\ 5$	$IT\ 6$	$IT\ 7$	$IT\ 8$	$IT\ 9$	$IT\ 10$	$IT\ 11$	$IT\ 12$	$IT\ 13$	$IT\ 14$	$IT\ 15$	$IT\ 16$
Tolerance values	$7i$	$10i$	$16i$	$25i$	$40i$	$64i$	$100i$	$160i$	$250i$	$400i$	$640i$	$1000i$

Table Q3(ii) Fundamental tolerances of grades 01, 0 and 1 to 16 (values of tolerances in microns)

<i>Diameter steps in mm</i>	<i>Tolerance Grades</i>												
	<i>01</i>	<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>
Over 30 To and inc 50	0.6	1	1.5	2.5	4	7	11	16	25	39	62	100	160
Over 50 To and inc 80	0.8	1.2	2	3	5	8	13	19	30	46	74	120	190
Over 80 To and inc 120	1	1.5	2.5	4	6	10	15	22	35	54	87	140	220
Over 120 To and inc 180	1.2	2	3.5	5	8	12	18	25	40	63	100	160	250