MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMM 101: ENGINEERING DRAWING AND DESIGN II

DATE: 20/5/2019 **TIME: 8.30-11.30 AM**

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

All dimensions are in millimetres unless otherwise stated.
Construction lines should be faint and should not be erased.
Accuracy and good line work are essential.

QUESTION ONE 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 TWO (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 aboveand (*iii*) the sectional view from the right through the centre of the block. Front view is as indicated by the arrow.

QUESTION THREE (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).** (3 marks)

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 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)** (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 kΩ resistor
2.	100 kΩ variable resistor
3.	Light Dependant Resistor
4.	1 MΩ resistor
5.	NPN transistor: BC108 (or equivalent)
6.	0.1 µF Capacitor
7.	1 MΩ resistor
8.	47 kΩ resistor
9.	1 MΩ variable resistor
10.	10µF Capacitor
11.	Low-power timer IC
12.	1 MΩ resistor
13.	0.01µF capacitor
14.	Beeper 9-12V (Speaker)
15.	9V DC battery
16.	Switch

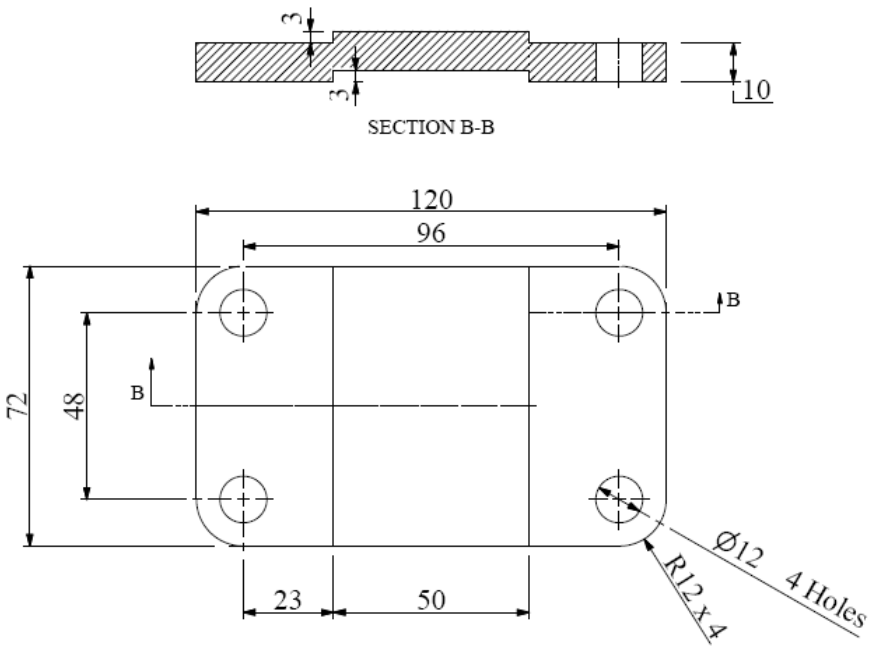


Fig Q1: Part 1

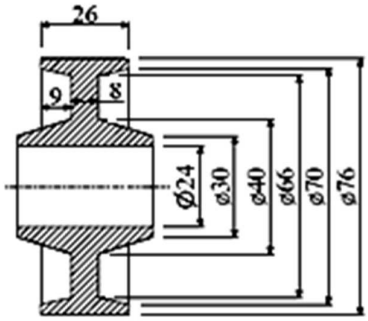


Fig Q1: Part 4

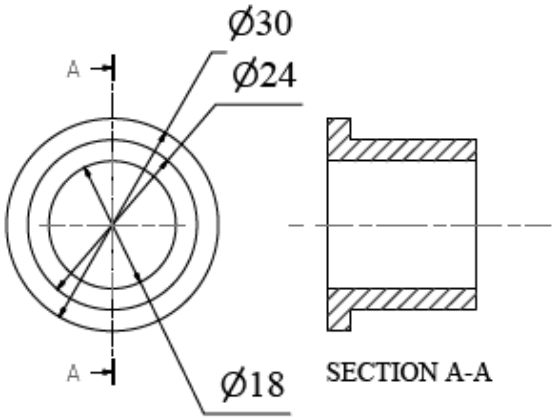


Fig Q1: Part 5

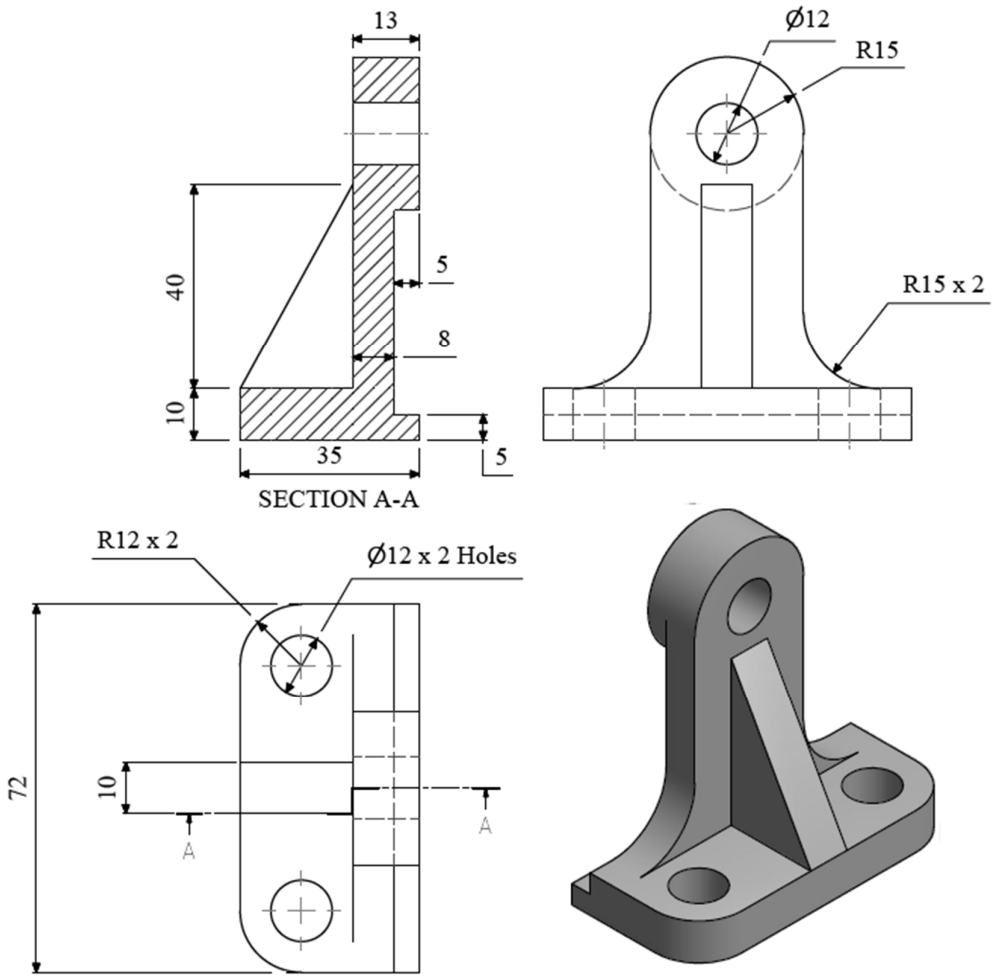


Fig Q1: Part 2

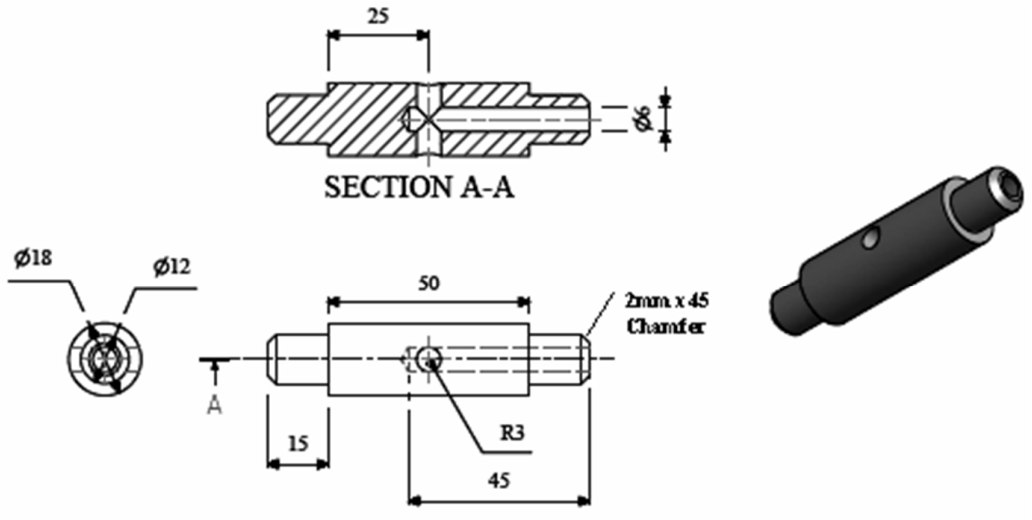
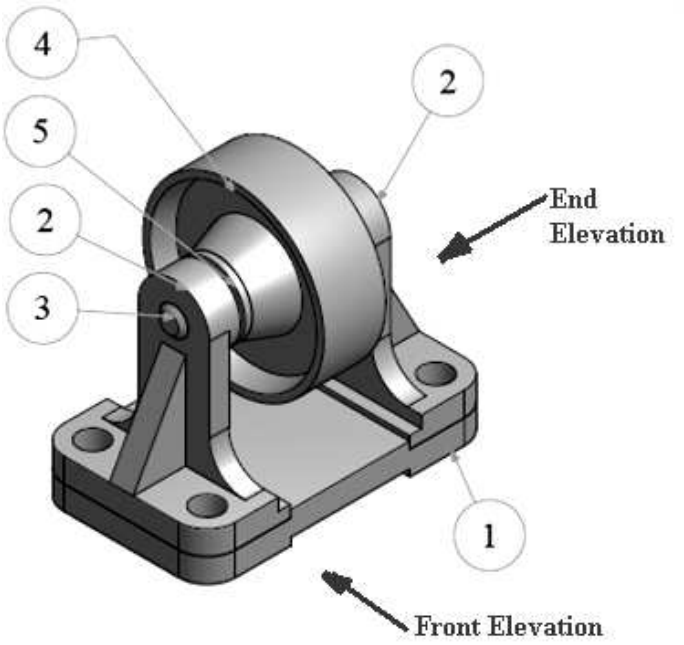


Fig Q1: Part 3



Parts List	
PART NUMBER	QTY
1	1
2	2
3	1
4	1
5	2

Fig Q1: Assembly

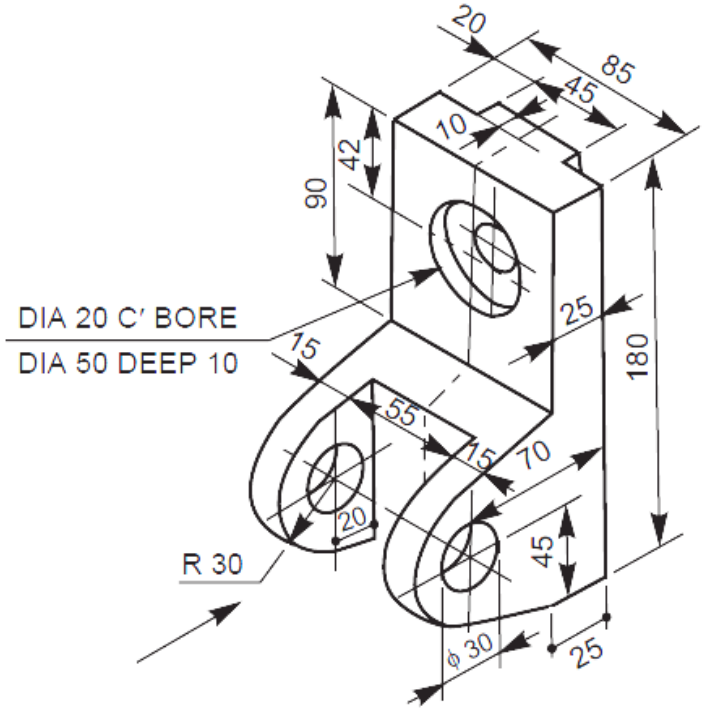


Figure Q2

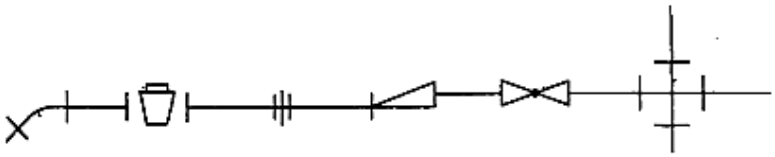


Figure Q5 (a)

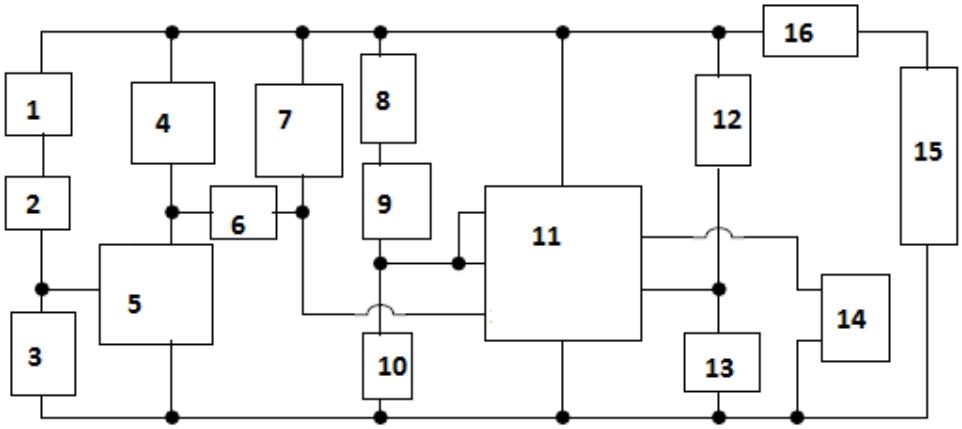


Figure Q5 (b)

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)

Diameter steps in mm	*Tolerance Grades*												
	01	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
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