

NANYANG TECHNOLOGICAL UNIVERSITY
SEMESTER 1 EXAMINATION 2021-2022
MA2005 - ENGINEERING GRAPHICS

November / December 2021

Time Allowed: 2 1/2 hours

Seat Number:

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Matriculation Number:

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INSTRUCTIONS TO CANDIDATES

1. This Question and Answer (Q & A) Book contains **FOUR (4)** questions and comprises **FIFTEEN (15)** pages.
2. Answer **ALL** the questions and all questions carry equal marks.
3. Write your answers for all the questions in the Q & A Book.
4. Do not write your name on the Q & A Book.
5. Write your matriculation number on the front page of this Q & A Book.
6. Candidates are **NOT** allowed to remove any page from the Q & A Book.
7. This Q & A Book, used or unused, must not be removed from the Examination Hall. It **MUST BE HANDED IN** at the end of the examination.
8. This is a **CLOSED - BOOK** examination.

EXAMINER'S USE ONLY	
Questions	Marks
①	
②	
③a	
③b	
④	
Total	

1(a) Two complete views of an object as shown in Figure 1(a) is presented in First Angle Projection. Draw the front elevation of the object showing all the construction lines and outlines with hidden details clearly.

(12 marks)

112

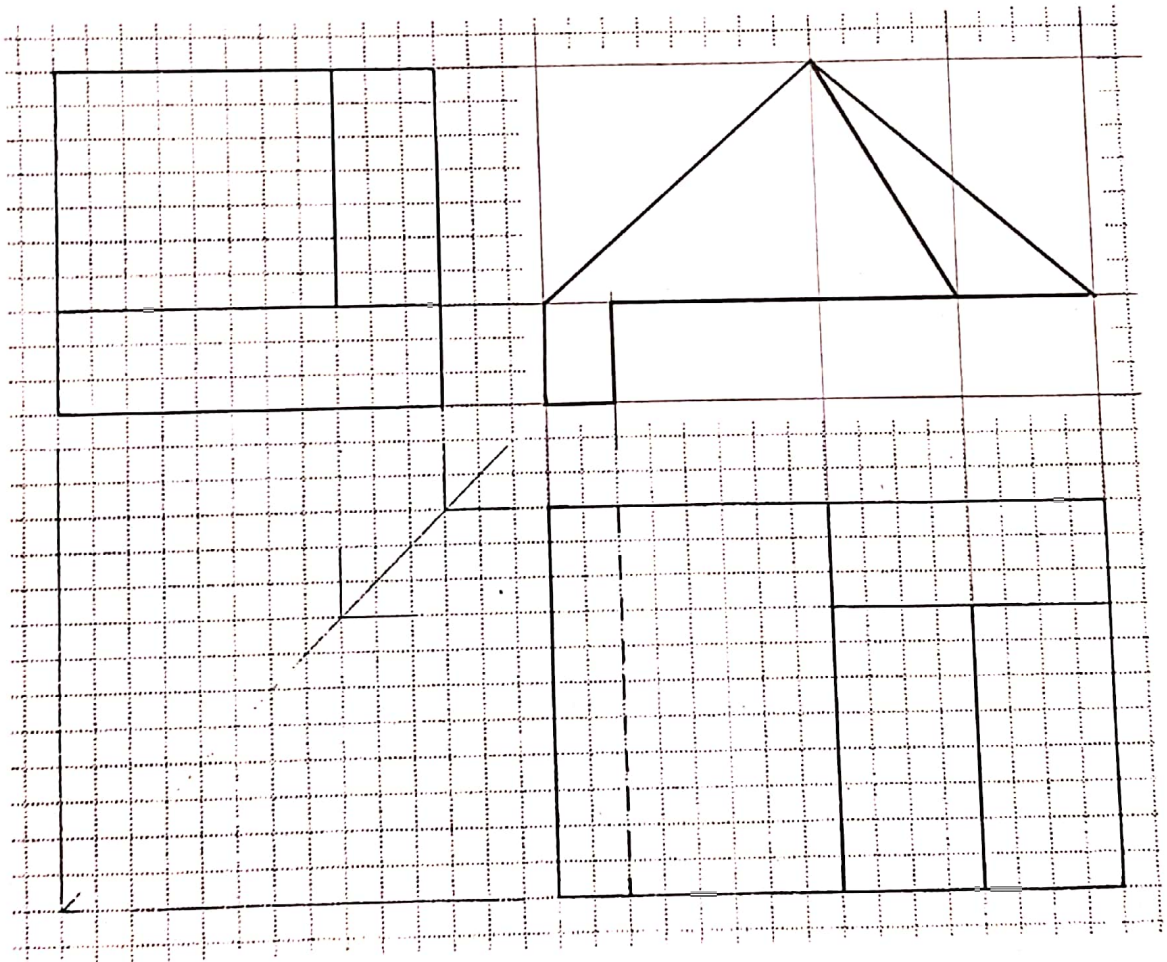


Figure 1(a)

1(b) An object as shown in Figure 1(b) are given in the Third Angle Projection. Draw the first auxiliary view of the object in the direction of A. Hidden details are required.

(13 marks)

/ 13

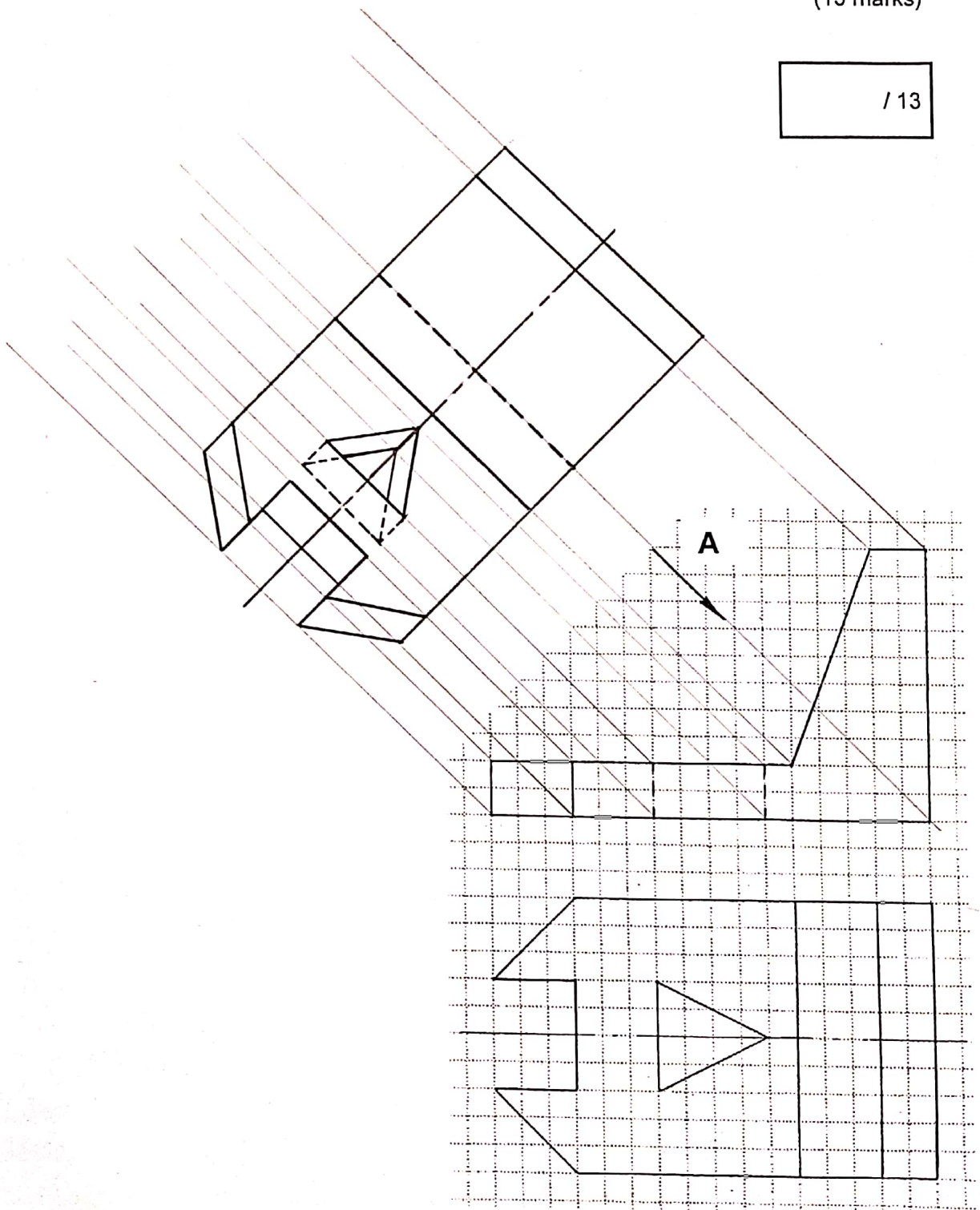


Figure 1(b)

2(a) Figure 2(a) shows the complete orthographic views of an object presented in First Angle Projection. Using the isometric paper provided, draw full size the isometric drawing of the object so that point A will be the highest point in the drawing. Hidden details are not required. Each grid unit represents 5 mm. (12 marks)

/ 12

Note: Each grid unit represents 5 mm

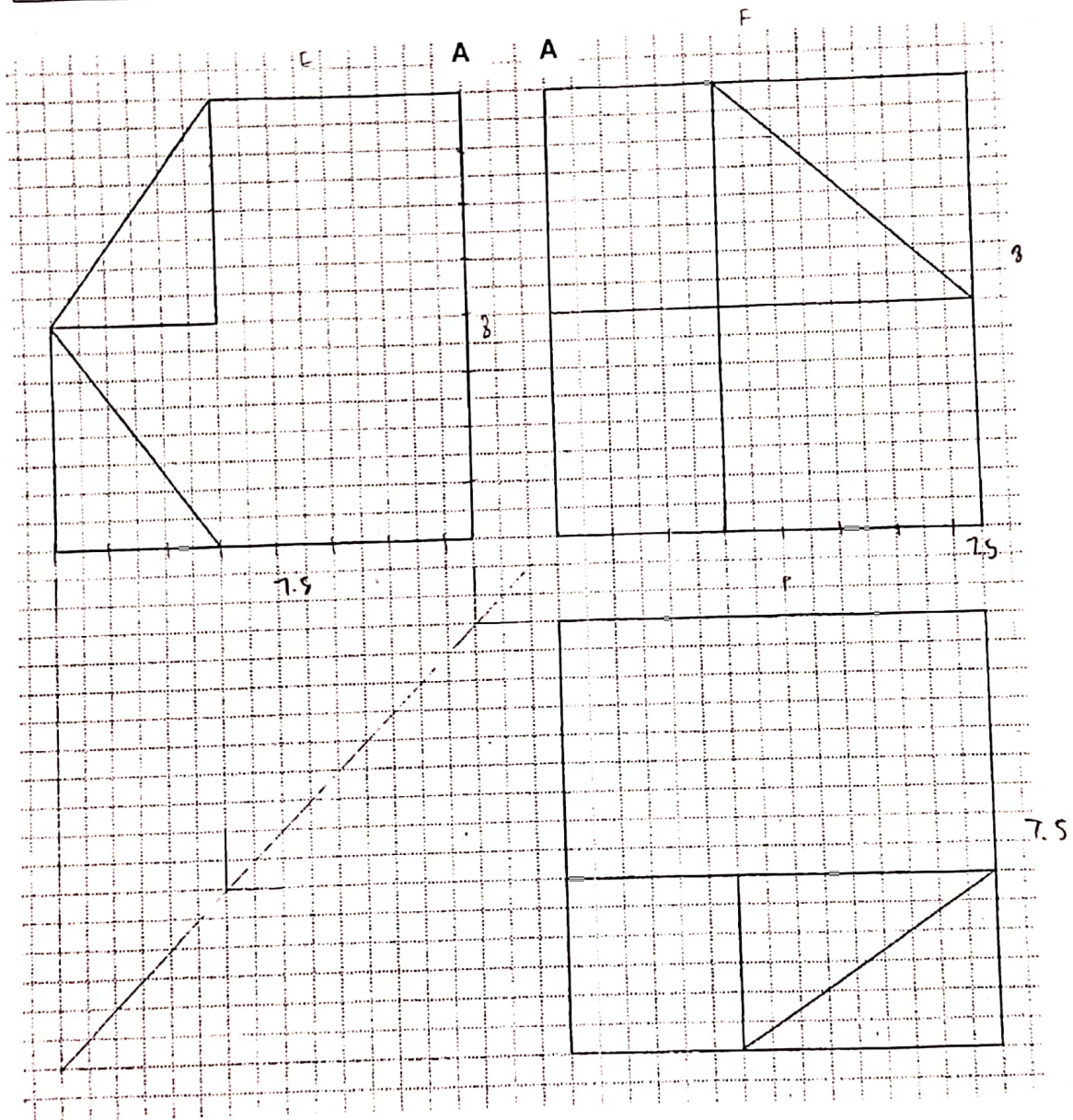
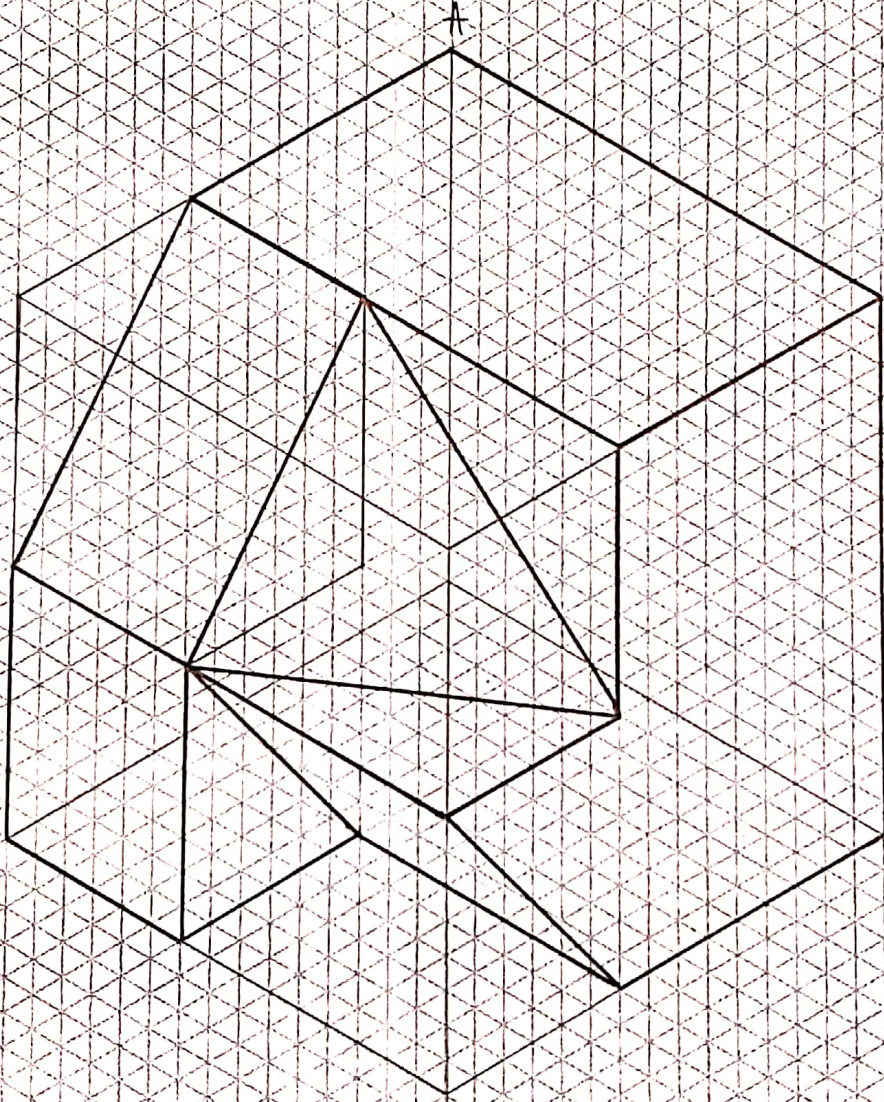


Figure 2(a)

Note: Each grid unit represents 5 mm



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2(b) Figure 2(b) shows the front elevation and plan of a hollow truncated hopper (i.e. no cover and base) in First Angle Projection. Draw its development of the hopper. Begin the pattern from the joint A-1 and seam allowance is not required. (13 marks)

/ 13

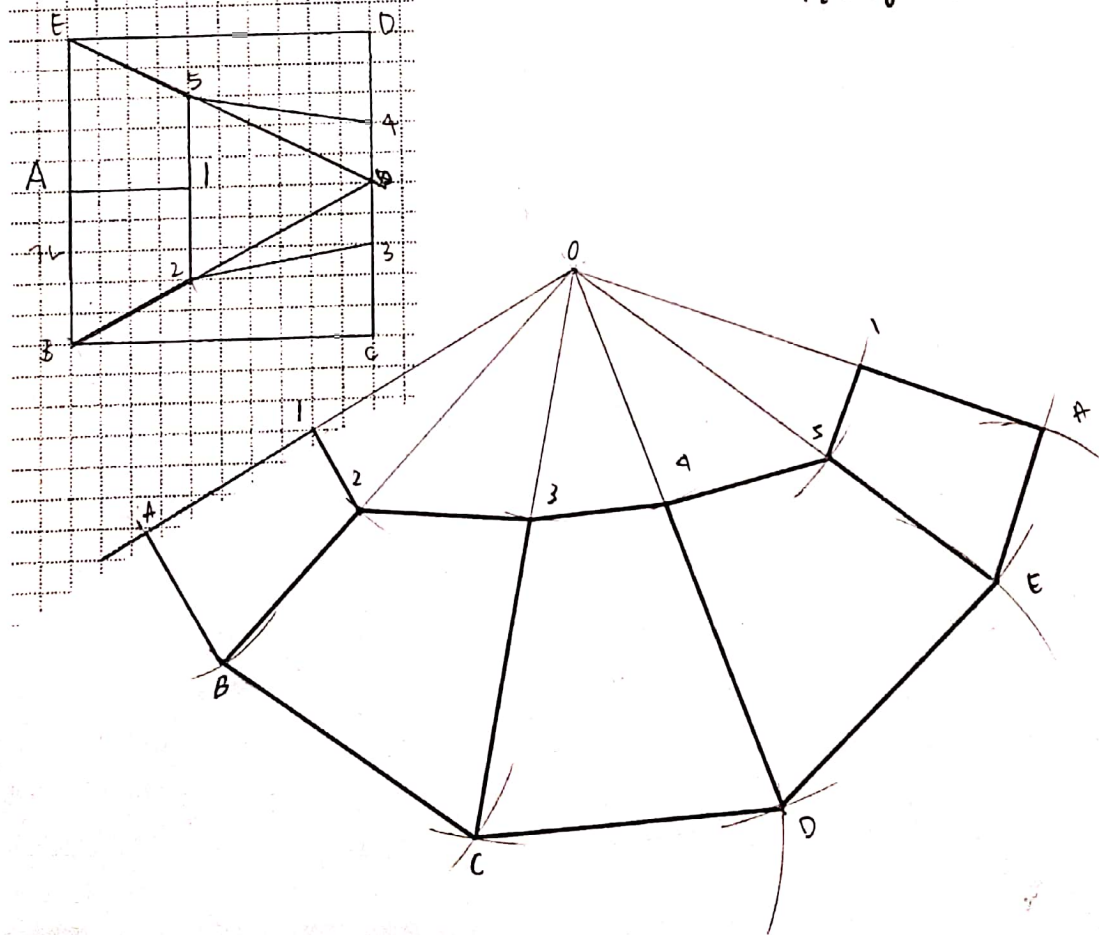
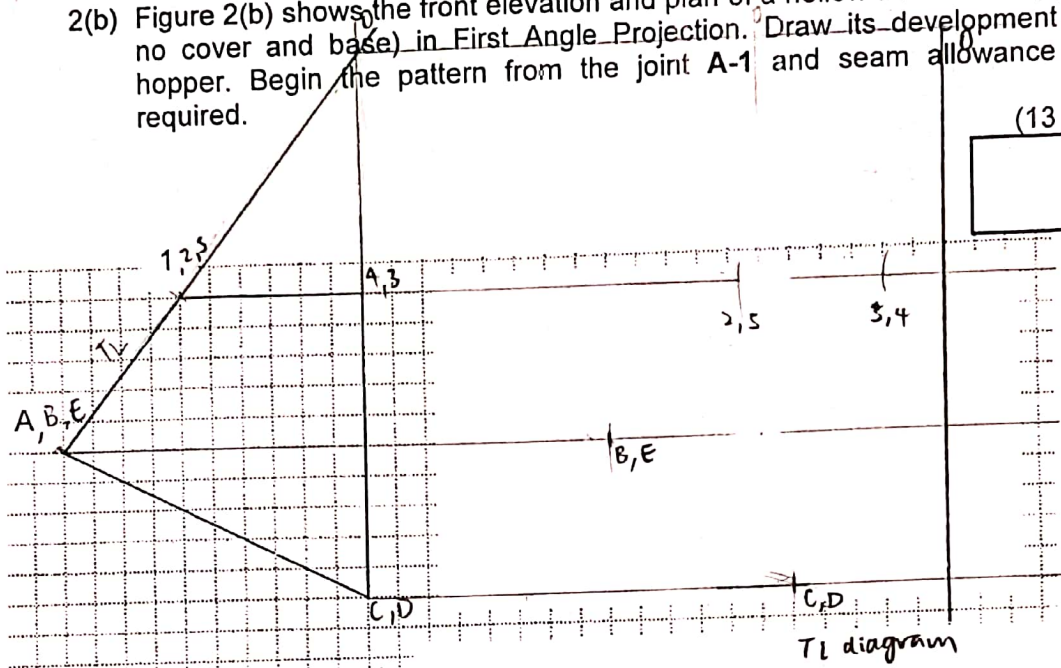


Figure 2(b)

3(a) An object as shown in Figure 3(a) is presented in the Third Angle Projection. Draw a sectional view on A-A of the object showing all the construction lines and outlines clearly. Hidden lines are not required.

(13 marks)

/ 13

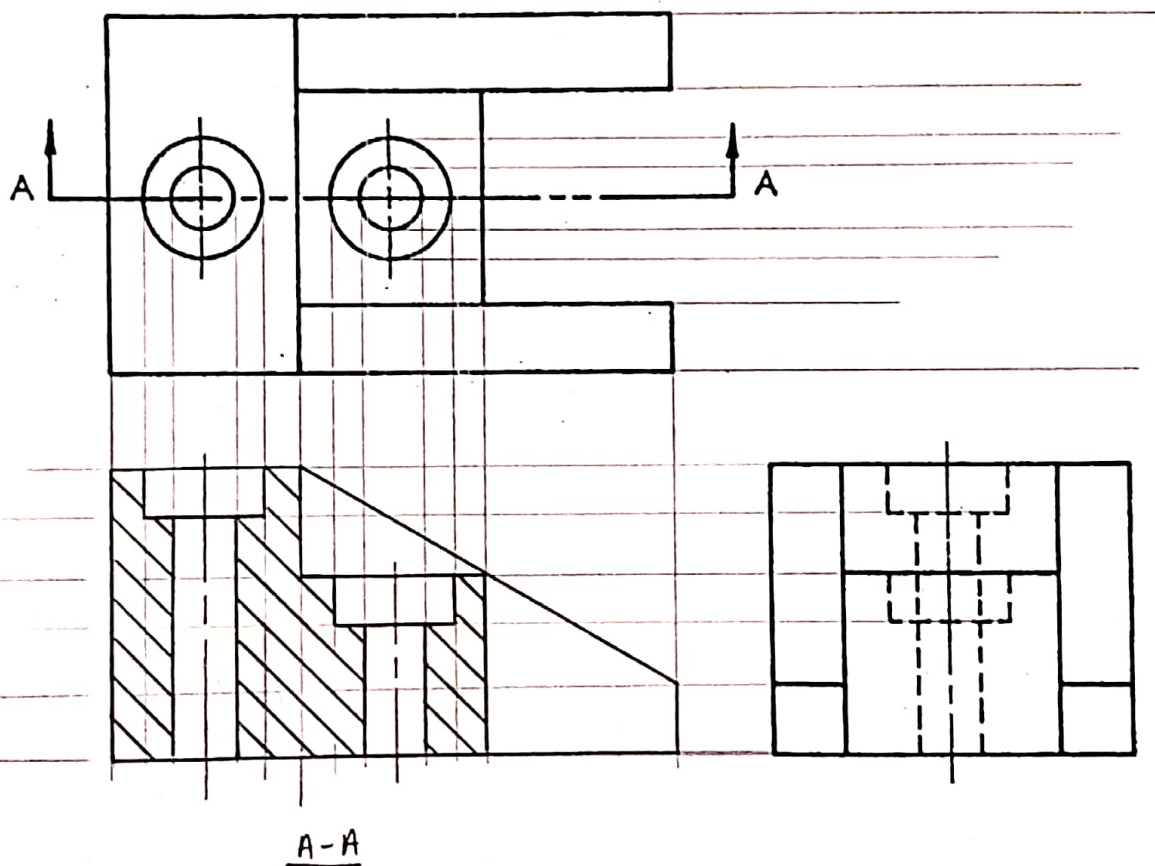
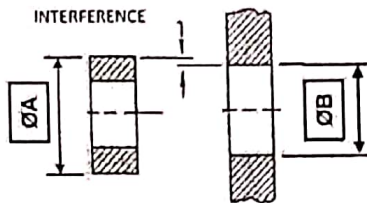


Figure 3(a)

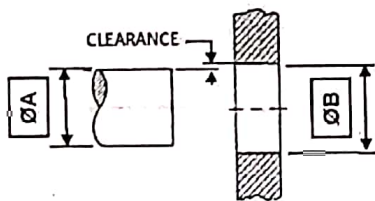
3(b) Determine and enter the missing dimensions into each of the tables as shown in Figure 3(b).
(12 marks)

/ 12



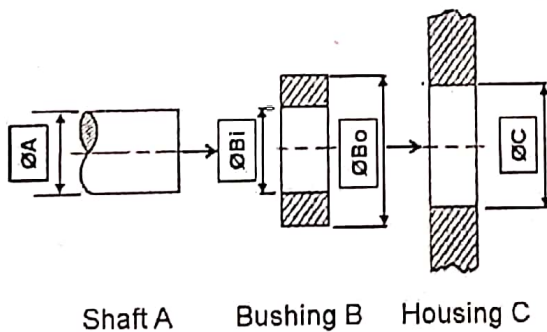
		ØA	ØB
Basic dimension		--	95.750
-	Upper limit	96.091	95.894
	Lower limit	95.966	95.750

Bore B to have a tolerance of 0.144, bushing A to have a tolerance of 0.125 and a minimum interference of 0.072.



		ØA	ØB
Basic dimension		106.000	--
-	Upper limit	106.000	106.187
	Lower limit	105.650	106.085

Hole B to have a tolerance of 0.102, shaft A to have a tolerance of 0.350 and a minimum clearance of 0.085



Shaft A Bushing B Housing C

Fitting between B & C		ØBo ^s	ØC ^H
Type of Fit	Basic dimension	--	82.750
H7/h6	Upper limit	82.894	82.785
	Lower limit	82.874	82.750

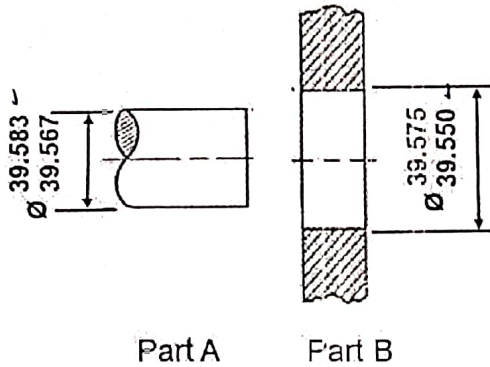
Fitting between A & B		ØBi ^h	ØA ^s
Type of Fit	Basic dimension	--	68.250
F8/h7	Upper limit	68.326	68.250
	Lower limit	68.280	68.220

Fitting conditions:

Force drive fit between bushing B and housing C; close running fit between shaft A and bushing B. (Refer to tables in the Appendix. Use ISO code for type of fit)

Figure 3(b)

4(a) Determine and enter the missing data into the table as shown in Figure 4(a). (5 marks)

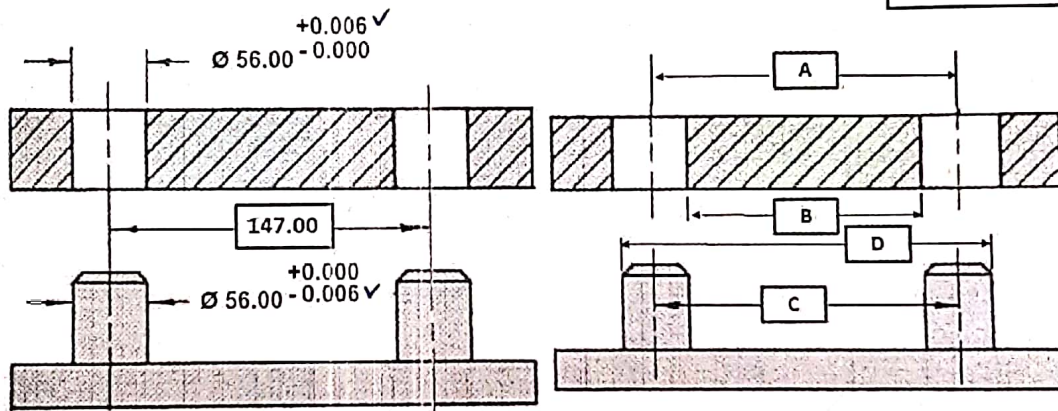


Description	Dimensions/Type of fits
Basic Size	39.550
Lower deviation of part A	0.017
upper deviation of part B	0.025
Allowance	-0.033
Type of fits	Transition

/ 5

Figure 4(a)

4(b) Determine and enter the missing data as shown in Figure 4(b). (4 marks)



/ 4

For correct assembly of holes and pins	Maximum permissible value of A When C=147.000	Minimum permissible value of B When C=147.000	Minimum permissible value of C When A=147.000	Minimum permissible value of D When A=147.000
Both holes and pins are at their Least Material Condition (LMC)	147.012	91.006	146.933	202.922

147 - LMC pin + LMC hole

Figure 4(b)

147 - LMC pin

147 - LMC hole + LMC pin

147 - LMC hole + LMC pin x2

4(c) A Pin rests freely inside a hole located on the top right corner of a boss. The upper and lower limits of the centers of the hole and boss are shown in Figure 4(c). Use the maximum permissible tolerances as the position tolerances required in Figure 4(d). The position tolerances must be rounded up to two decimal places and are applied as indicated in the Feature Control Frame (FCF) in Figure 4(d). Enter suitable tolerance symbols, tolerances and dimensions, where appropriate, in the sketch provided in Figure 4(d). In addition, determine and enter the minimum and maximum distances as shown in the table within Figure 4(d). Round up your results to three decimal places.

(16 marks)

/ 16

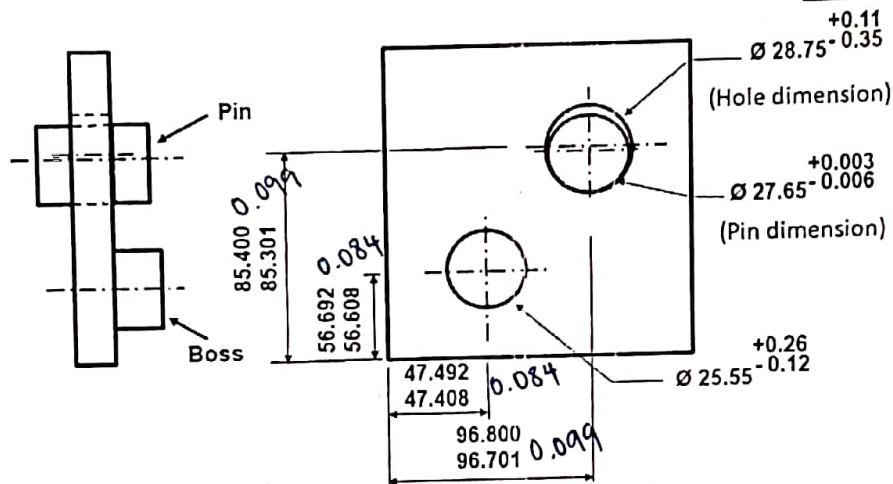
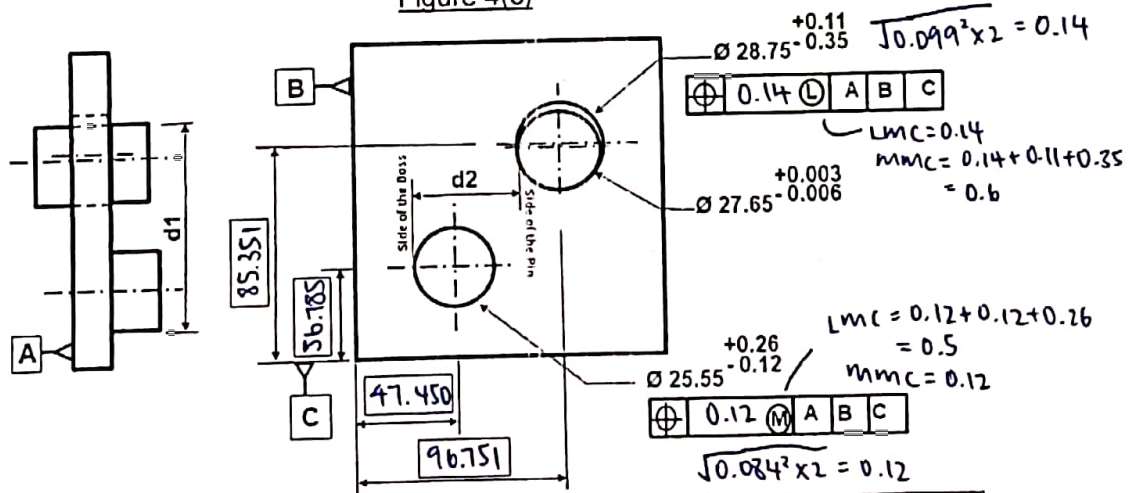


Figure 4(c)



①
 LMC
 Hole = 28.86
 Boss = 27.43
 MMC
 Pin = 27.653

②
 MMC
 Hole = 27.4
 Boss = 25.81
 LMC
 Pin = 27.644

Conditions	Minimum d1	Maximum d1	Minimum d2	Maximum d2
① → Hole and boss are at LMC. Pin is at MMC	-	-	46.870	47.510
② → Hole and boss are at MMC. Pin is at LMC	54.553	55.275	-	-

Figure 4(d)

$$85.351 - 56.785 + \frac{25.81}{2} - \frac{28.4}{2} + 27.644 - \frac{0.6}{2} - \frac{0.12}{2} = 54.555$$

$$96.751 - 47.45 + \frac{25.43}{2} - \frac{27.653}{2} - \frac{0.5}{2} - \frac{0.14}{2} = 46.870$$