National Exams May 2018

04-BS-15, Engineering Graphics and Design Process

3-Hours Duration

NOTES

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a closed book examination. No calculator is permitted.
3. Five (5) questions constitute a complete exam paper. Clearly label the answers in the answer book.
4. All sketches must be made freehand and must be easy to read and neat. Straightedges may not be used.
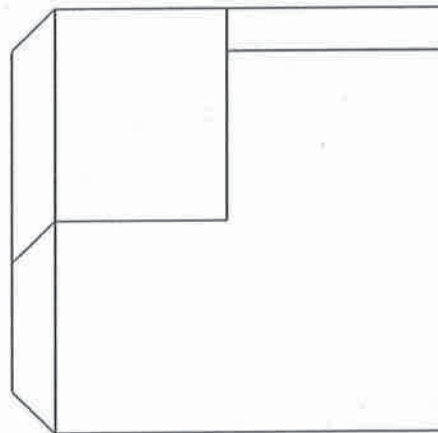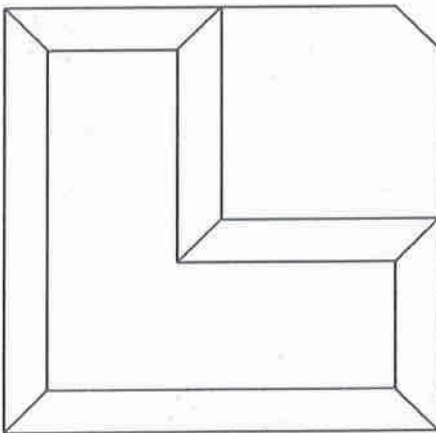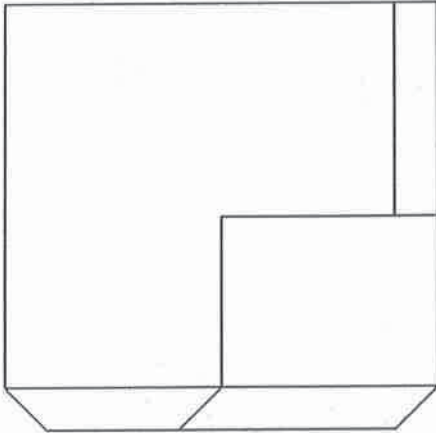
QUESTION 1

For the part shown below,

a) Sketch an appropriate set of orthographic views, using third-angle projection. (10 marks)

b) Fully dimension the sketch in part a) using professional standards. Use "xx" in place of numerical values in the dimensions. (10 marks)

c) Describe and sketch an appropriate sequence of feature-based solid modelling operations that could be used to create this geometry using parametric, feature-based solid modelling CAD software. (15 marks)

d) Describe and discuss appropriate manufacturing methods for this part, and any issues that might arise. (15 marks)
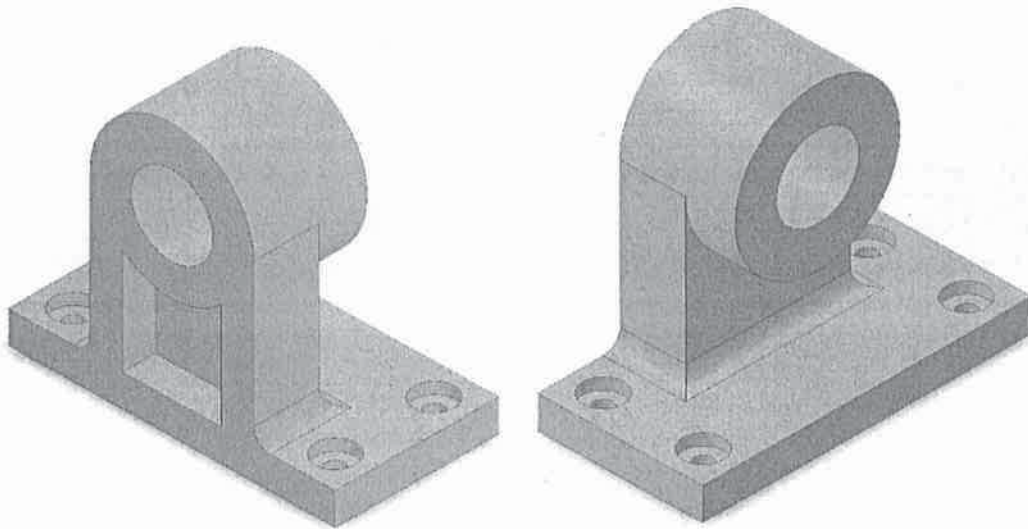
QUESTION 2

The multiview drawing below uses 3rd-angle projection. Sketch an isometric view. (10 marks)
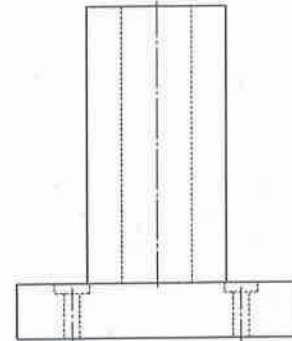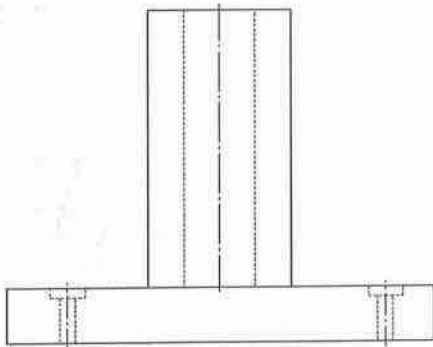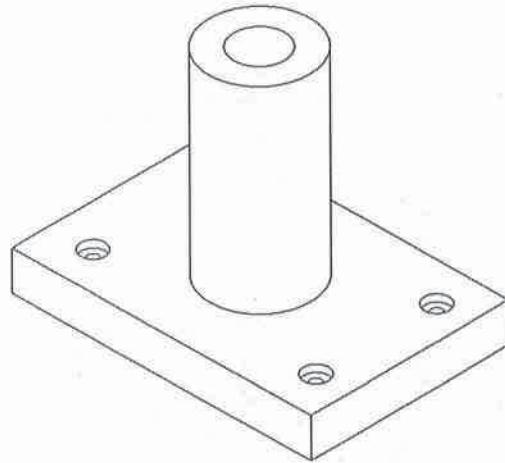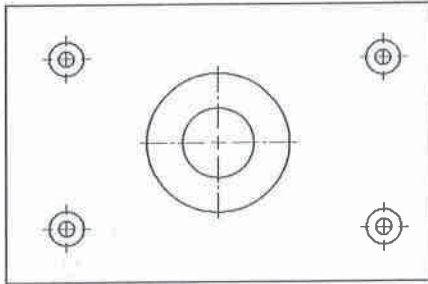
QUESTION 3

Explain the meaning of the table shown below, and how it is used in design. Use sketches to support your explanation. (10 marks)

	ISO SYMBOL			
	HOLE BASIS	SHAFT BASIS		
CLEARANCE FITS	H11/o11	C11/h11	LOOSE RUNNING FIT.	FOR WIDE COMMERCIAL TOLERANCES OR ALLOWANCES ON EXTERNAL MEMBERS.
	H9/d9	D9/h9	FREE RUNNING FIT	NOT FOR USE WHERE ACCURACY IS ESSENTIAL, BUT GOOD FOR LARGE TEMPERATURE VARIA-TIONS, HIGH RUNNING SPEEDS, OR HEAVY JOURNAL PRESSURES.
	H8/f7	F8/h7	CLOSE RUNNING FIT	FOR RUNNING ON ACCURATE MACHINES AND FOR ACCURATE LOCATION AT MODERATE SPEEDS AND JOURNAL PRESSURES.
	H7/g6	G7/h6	SLIDING FIT	NOT INTENDED TO RUN FREELY, BUT TO MOVE AND TURN FREELY AND LOCATE ACCURATELY.
	H7/h6	H7/h6	LOCATIONAL CLEARANCE FIT	PROVIDES SNUG FIT FOR LOCATING STATION-ARY PARTS; BUT CAN BE FREELY ASSEMBLED AND DISASSEMBLED.
TRANSITION FITS	H7/k6	K7/h6	LOCATIONAL TRANSITION FIT	FOR ACCURATE LOCATION, A COMPROMISE BETWEEN CLEARANCE AND INTERFERENCE.
	H7/n6	N7/h6	LOCATIONAL TRANSITION FIT	FOR MORE ACCURATE LOCATION WHERE GREATER INTERFERENCE IS PERMISSIBLE.
INTERFERENCE FITS	H7/p6*	P7/h6	LOCATIONAL INTERFERENCE FIT	FOR PARTS REQUIRING RIGIDITY AND ALIGN-MENT WITH PRIME ACCURACY OF LOCATION BUT WITHOUT SPECIAL BORE PRESSURE REQUIREMENTS.
	H7/s6	S7/h6	MEDIUM DRIVE FIT	FOR ORDINARY STEEL PARTS OR SHRINK FITS ON LIGHT SECTIONS, THE TIGHTEST FIT USABLE WITH CAST IRON.
	H7/u6	U7/h6	FORCE FIT	SUITABLE FOR PARTS WHICH CAN BE HIGHLY STRESSED OR FOR SHRINK FITS WHERE THE HEAVY PRESSING FORCES REQUIRED ARE IMPRACTICAL

Excerpt from *Machinists' Handbook*, pg. 661, 25 Ed., Industrial Press.
*The H7/p6 Hole Basis fit is a transition fit for basic sizes in ranges from 0 through 3mm.

Technical Reference | Determining Metric Tolerances

QUESTION 4

Sketch an appropriate section view for the part shown below. (10 marks)

QUESTION 5

In the engineering design process, Quality Function Deployment (QFD) is a commonly used method. Describe the purpose and general procedure of QFD. (20 marks)