THE INSTITUTION OF ENGINEERS, SRI LANKA

Part 1 Examination – August 2007

PRESENTATION OF ENGINEERING INFORMATION

PAPER 1 – PRESENTATION OF INFORMATION

Time allowed: 3 hours

Answer **FIVE** questions selecting **at least one** from each of the three sections A, B and C.

To answer questions No. 1, 2 and 3, the candidates should make neat, free hand sketches. Where applicable, the candidate should clearly show the details of geometrical constructions and principles of operations, mechanisms etc., associated with the components/products.

Use separate answer books for each section.

SECTION A

Question 1

Answer any three parts of this question.

a) Sketch an exploded assembly drawing of an adjustable spanner. Name its components. The exploded view should best illustrate the adjusting mechanism. The components should have sizes decided proportionately.

b) Sketch three orthographic views of a pipe wrench. Prepare a part list as a requirement of the drawing.

c) A domestic water pump consists of an induction motor, centrifugal pump and a centrifugal switch. The switch connects and disconnects the electrical condenser from the electrical circuit as and when necessary.

    i) Sketch the view that best illustrates the assembly of all components of the pump-motor assembly.

    ii) Draw the electrical wiring diagramme consisting of the centrifugal switch and the condenser to show the close and open positions of the circuit. Use standard electrical symbols in the diagramme.

d)   i) What are the recommended scales for the following drawings?

      • Enlarged

      • Full size

      •

ii) Illustrate the lines that represent following applications.

- Lines of symmetry
- Hidden lines
- Cutting planes
- Limits of partial or interrupted views and sections if the limit is not an axis
- Outlines and edges of adjacent parts

iii) Draw the symbolic presentation for internationally approved two methods of projections used in engineering drawing. Illustrate the recommended proportions on one of the symbolic presentations.

iv) Present the tolerances involved in the following applications using standard symbols. Any assumptions you may make should be stated.

- A flywheel fits on to a 50 mm diameter shaft. The flywheel closely slides along the shaft and both are coupled by a key in the assembly process.

- A steel cylinder liner with 75 mm outer diameter is shrunk fitted into its mating cylindrical surface of an engine block of an internal combustion engine.

- A machined flat surface has a texture with **Ra** value 0.4 μm minimum and 0.8 μm maximum over a length of 500 mm.

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Question 2

Figure Q2 shows a pictorial vies of a solid object. Produce the following views to a scale of full size in the first angle projection.

a) Front Elevation taken on plane **X-X**

b) End Elevation taken on plane **Y-Y** and projected to the left of view (a).

c) Plan

Question 3

a) Figure Q3 (a) consists of two views showing a penetration of right circular cone through a cylinder with their axes intersecting each other perpendicularly. Complete the two views drawing the interpenetration curves.

b) Figure Q3 (b) shows the Elevation and End Elevation of a solid object. Sketch the isometric view of it taking the near point described by the two arrows.

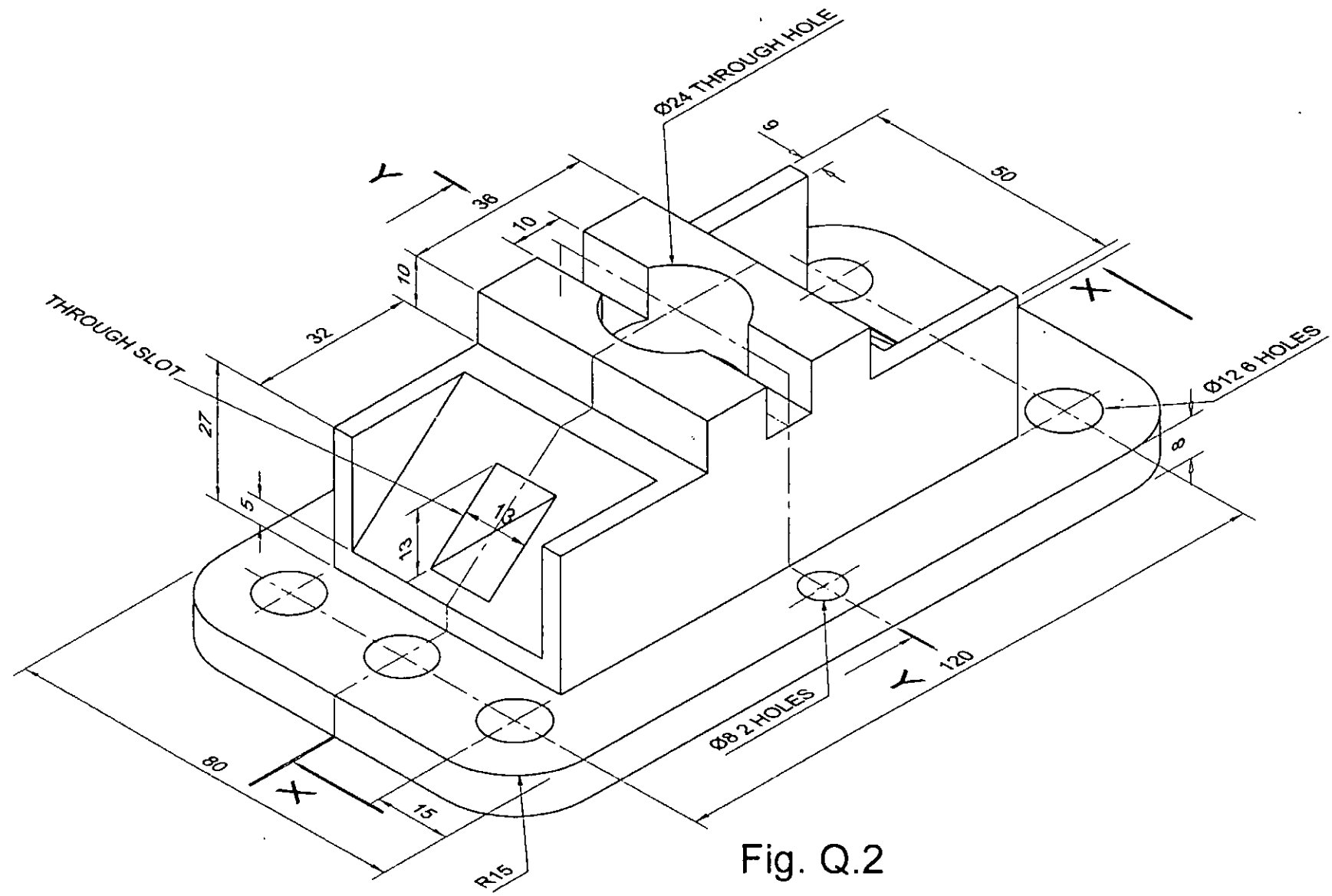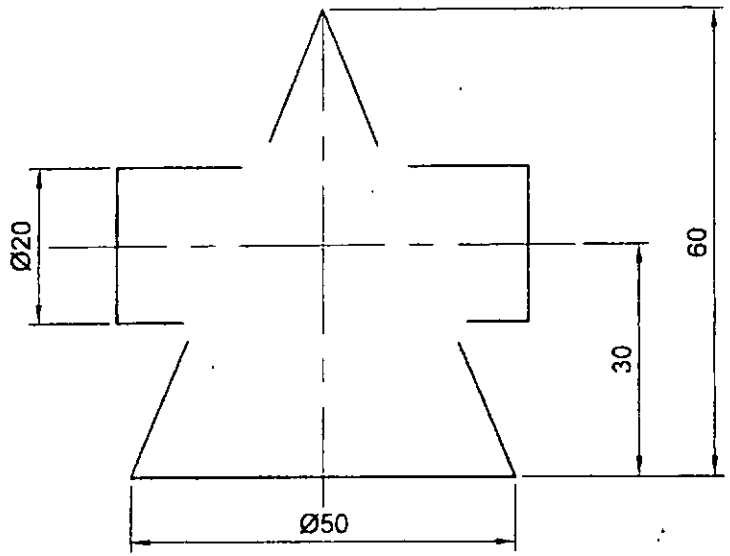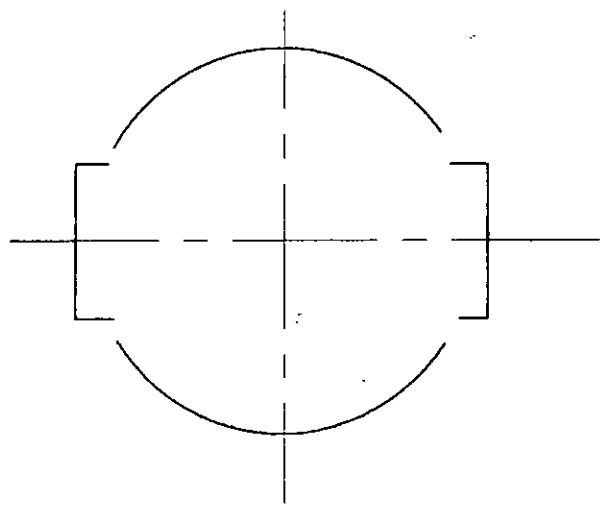Fig. Q.2

Ø24 THROUGH HOLE

THROUGH SLOT

Ø12 6 HOLES

Ø8 2 HOLES

R15

FRONT ELEVATION

PLAN

Figure Q3(a)

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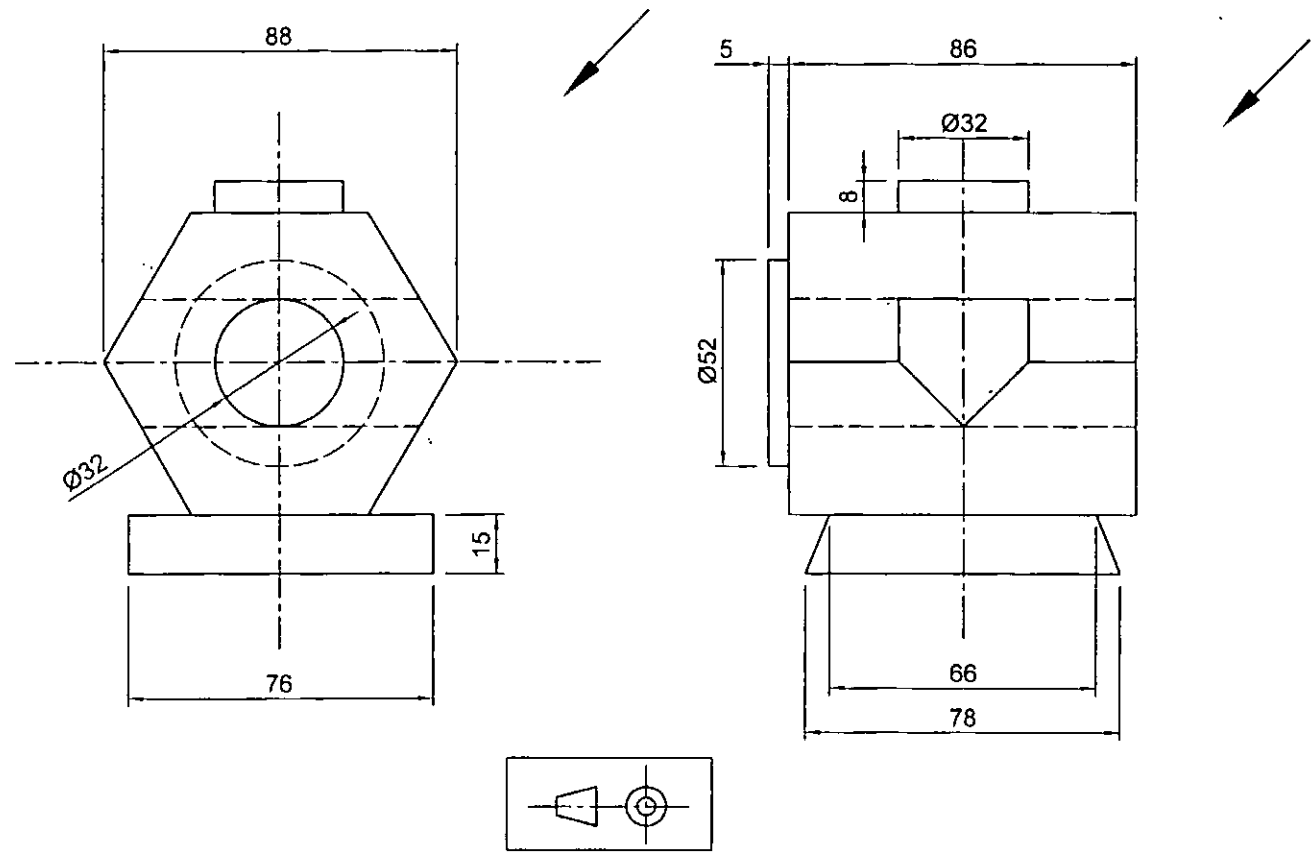
Figure Q3b

Section B

Q4. You are to construct an algorithm to sort five integers in descending order.

a) Draw a data flow diagram that describes the input of the five integers and gives back the integers in descending order as the output.

b) Present the above algorithm as a pseudo-code programme. *You may also use a high-level programming language such as PASCAL, ADA, FORTRAN etc. State clearly the chosen programming language.*

Q5. In a game played by junior students, a random number is drawn from a set of numbers between 0 and 10 (both inclusive). A **win** is awarded if a **prime number** is drawn, and a loss otherwise.

a) Construct a logical function to describe the **winning** situation of the game.

b) Simplify this function with the help of a suitable Karnaugh map.

c) Realise this function using 4-input NAND gates.

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Q. 06. A construction company has decided to modernize and refit of its ~~~~~~~s. Some of the existing equipments will be disposed of but the remain~~~ returned to the section of completion of the renovation work.

Tenders are invited from a number of selected contractors. The contractors wi~~ responsible for all the activities in connection with the renovation work excepting th~ prior removal of the old equipment and its subsequent replacement. The major elements of the project have been identified as follows along their duration and immediately preceding elements.

Activity	Description	Duration week	Immediate predecessors
A	Design new premises	14	--
B	Obtain tenders from the contractors	04	A
C	Select the contractor	02	B
D	Arrange details with selected contractor	01	C
E	Decide which equipment is to be used	02	A
F	Arrange storage of equipment	03	E
G	Arrange disposal of other equipment	02	E
H	Order new equipment	04	E
I	Take delivery of new equipment	03	H,L
J	Renovation take place	12	K
K	Remove old equipment for storage or disposal	04	D,F,G
L	Cleaning after the contractor has finished	02	J
M	Return old equipment for storage	02	H,C

(a) Draw the network diagram showing the inter-relations between the various activities of the project.

(b) Calculate the minimum time that the renovation can take from the design stage.

SECTION C

Q.07 The width of a certain type of steel sheet is supposed to be not less than 19.8 m and or more than 20.3 m. and thickness of the sheet is supposed to be not less than 0.19 cm. and not more than 0.21 cm.

These sheets are produced by a machine in such a way that their widths are normally distributed with mean 20.02 m. and the standard and deviation 0.10 m. and their thickness are independently normally distributed with mean 0.200 cm. and standard deviation 0.005 cm.

Find the probability that a randomly chosen sheet will
(a) meet the width specification,
(b) meet the thickness specification,
(c) fail both to meet the width specification and to meet the thickness specification,
(d) fail to meet at least one specification.

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If five sheets are selected at random, what is the probability that at ... ll meet the width specification.

Suppose it is required that not more than 1% of all sheets be more than 20.2... If the standard deviation of width is kept at 0.10 m. what mean width is requi...

Q.08 In the manufacture of a certain scientific instrument, great importance is attached ... the life of a particular critical component. This component is obtained in bulk from two sources (A and B), and in the course of inspection the lives of 1000 of the components from each source are determined and the following frequency tables are obtained.

Source A		Source B	
Life (hours)	No. of components	Life (hours)	No. of components
1000-1020	40	1030-1040	339
1020-1040	96	1040-1050	136
1040-1060	364	1050-1060	25
1060-1080	372	1060-1070	20
1080-1100	85	1070-1080	130
1100-1120	43	1080-1090	350

(a) Draw a histogram for source A and a cumulative frequency graph for source B.
(b) Find the mode and the median for source A and B.
(c) Find the mean, and the standard deviation for source A and B.
(d) Find the skew ness for source A and B.
(e) Find the combined mean of the two sources B.

Q.09 (a) Express $P_{(E \cup F)}$ in terms of $P_{(E)}$ and $P_{(F)}$ when the events E and F are (a) mutually exclusive and (b) independent ?

State in words the meaning of $P(G/H)$ for two events G and H.

(b) Random events X and Y are mutually exclusive and events X and Z are independent.

Given that $P_{(X)} = \dfrac{1}{4}$, $P_{(Y)} = \dfrac{1}{5}$, $P_{(X \cup Z)} = \dfrac{1}{2}$, $P_{(Y \cap Z)} = \dfrac{1}{15}$

Find (a) $P_{(X \cup Y)}$ (b) $P_{(X \cap Y')}$ (c) $P_{(X \cap Z)}$ (d) $P_{(Y \cap Z')}$

(c) A wholesaler buys all his car bulbs from two different factories A and B. He buys twice as many bulbs from factory B as he does from factory A. The probability of bulb from factory A being of standard quality is P_A and the probability of bulb from factory B being of standard quality is P_B.

A motorist purchases two bulbs from the wholesaler's stocks. Find the probability that both bulbs came from the same factory.

Find in terms of P_A and P_B the probability that (a) both bulbs come from the same factory and are of standard quality.

(d) Both bulbs come from the same factory given that it is known that both bulbs are of standard quality.

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