436-105 ENGINEERING COMMUNICATIONS

Student Number: ……………….

Examination duration: 3 hours
Reading time: 15 minutes
This paper has: 7 pages

Authorised materials:
Electronic calculators and drawing instruments may be used.

Instructions to invigilators:
Candidates are to complete the examination by writing and drawing in this examination paper, which must be collected at the end of the examination. No additional script books should be required.

Instructions to students:
Attempt all of the five questions. All questions are of equal value.
Space is provided in this paper to complete all the questions. No additional script books should be required. The whole paper must be left for collection by the invigilators at the end of the examination.
Be sure to write your student number in the space provided above.

Library:
This paper is to be reproduced and lodged with the Baillieu Library.
**Question 1**

Front and side views of a tripod-type fixed landing gear for a light aircraft are shown in figure 1.

(a) **Draw** the top view.

(b) **Determine**, graphically, the true length of the strut BD and the true angle it makes with the horizontal plane.

(c) **Make** an isometric sketch of the landing gear.

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**Figure 1** (Scale 1:250)
**Question 2**

A wire runs from point A, as shown in figure 2, and passes through a rectangular hole in a steel plate.

(a) **Determine**, graphically, the minimum distance from the wire to the edge of the hole.

(b) **Clearly mark** this shortest distance line in all views.

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**Figure 2** (Scale full size)
Question 3
The top and side views of a sheet-metal transition piece between two rectangular ducts are shown in figure 3. The transition piece is fabricated by folding a single flat sheet of steel along the edges AE, BF and CG, and welding along the edge DH.

Pattern development of the transition piece has commenced: the true shape of the face DHEA is shown in the figure.

Continue the development, by adding the faces AEFB and BFGC (leave face CGHD for someone else!).

Hint: Divide the faces into triangular areas by drawing diagonals. Each triangle can be laid out in the development as soon as the true length of each of its three sides have been determined.
Question 4
An isometric view of a cast iron socket is shown in figure 4. **Draw** the following views in third-angle projection:
(a) a top view
(b) a sectional view on A-A
(c) a side view from B

Fully **dimension** the part, and **provide** a title block and appropriate information about the part and the drawing.

Figure 4
**Question 5**

Consider again the problem posed in question 2. The diagram of the wire and plate is repeated here as figure 5, with relevant dimensions and a Cartesian coordinate system included.

Use vector algebra to **calculate** the minimum distance from the wire to the lower horizontal edge of the hole in the plate. **Write** your calculations on this page. Use the other side of the page if you need more room.

**Figure 5**

*Hint:* The shortest distance $SD$ between two lines which pass, respectively, through points $P_1$ and $P_2$ (defined by position vectors $\mathbf{r}_1$ and $\mathbf{r}_2$), and which have directions defined by the unit vectors $\mathbf{u}_1$ and $\mathbf{u}_2$, is given by

$$SD = (\mathbf{r}_2 - \mathbf{r}_1) \cdot \mathbf{u}$$

where

$$\mathbf{u} = (\mathbf{u}_1 \times \mathbf{u}_2)/|\mathbf{u}_1 \times \mathbf{u}_2|$$

is a unit vector perpendicular to both lines.

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**End of examination**

Page 7 of 7