

Wednesday 20 October 2021 – Afternoon

A Level Further Mathematics B (MEI)

Y433/01 Modelling with Algorithms

Printed Answer Booklet

Time allowed: 1 hour 15 minutes

You must have:

- Question Paper Y433/01 (inside this document)
- the Formulae Booklet for Further Mathematics B (MEI)
- a scientific or graphical calculator



| Please write cle | arly in | black | ink. | Do no | ot writ | e in the barcodes. | | | \ |
|------------------|---------|-------|------|-------|---------|--------------------|--|--|---|
| Centre number | | | | | | Candidate number | | | |
| First name(s) | | | | | | | | | |
| Last name | | | | | | | | | , |

INSTRUCTIONS

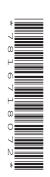
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided in the Printed Answer Booklet. If you need extra space use the lined pages at the end of the Printed Answer Booklet. The question numbers must be clearly shown.
- · Answer all the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Give your final answers to a degree of accuracy that is appropriate to the context.

INFORMATION

This document has 12 pages.

ADVICE

· Read each question carefully before you start your answer.



| 1(a) | |
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| 1(b) | |
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| | The answer space for Q2(a) and Q2(b) is on page 3 |
| 2(c) | The answer space for Q2(a) and Q2(b) is on page 3 |
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| 2(c) 2(d) | The answer space for Q2(a) and Q2(b) is on page 3 |
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| 2(a)(b) | |
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| 2(e) | |
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| 3(a)(i) | |
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| 3(a)(ii) | |
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| 2(1) | |
| 3(b) | |
| | Key: |
| | Key: Order of labelling Working values (do not cross out) |
| | (do not cross out) |
| | |
| | B 15 E |
| | $32\sqrt{41}$ F |
| | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ |
| | 10 27 18 |
| | $\begin{array}{c c} A & \begin{array}{c} & & & \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} C & \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} & & \\ \hline \end{array} \\ \hline \end{array} \\ \hline \begin{array}{c} & & \\ \hline \end{array} \\ \hline \end{array} \\ \hline \end{array} \\ I$ |
| | 8 16 |
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| | Shortest path from A to F: |
| | |

| 3(c) | STEP 1: | | |
|------|--------------------------------|-----------------------------|-------------------------|
| | Possible pairings of odd nodes | Corresponding shortest path | Length of shortest path |
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| 3(d) | STEP 2: | | |
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| | STEP 3: | | |
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| 4(a)(i) | Cut $\alpha =$ |
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| 4(a)(ii) | Cut $\beta =$ |
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| 4(b) | The maximum possible flow is |
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| 4(c) | |
| 4(0) | |
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| 4(d) | |
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| | Subject to |
| | SA - AB - AD = 0 SC - CB - CF = 0 |
| | AD + BD - DE - DT = 0 BF + CF - FG = 0 |
| | BG + EG + FG - GT = 0 |
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| | |
| | $SA \le 62$, $SB \le 71$, $SC \le 47$, $AB \le 43$, $AD \le 22$, $BD \le 39$, $BE \le 32$, $BF \le 43$, $BG \le 47$, $CB \le 25$, $CF \le 39$, $DE \le 33$, $EG \le 43$, $FG \le 42$ |
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| 4(e) | A B E T G |
|------|-------------------|
| 4(f) | |
| 4(g) | |

| Q | P | x | <i>y</i> | z | <i>s</i> ₁ | s_2 | <i>s</i> ₃ | <i>S</i> ₄ | <i>S</i> ₅ | RHS |
|---|---|---|----------|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----|
| Q | P | x | y | z | s_1 | <i>s</i> ₂ | <i>s</i> ₃ | S ₄ | S ₅ | RHS |
| Q | P | x | <i>y</i> | | <i>s</i> ₁ | s_2 | <i>s</i> ₃ | S_4 | <i>s</i> ₅ | RHS |
| | P | x | y | | s_1 | <i>s</i> ₂ | S ₃ | S ₄ | S ₅ | RHS |

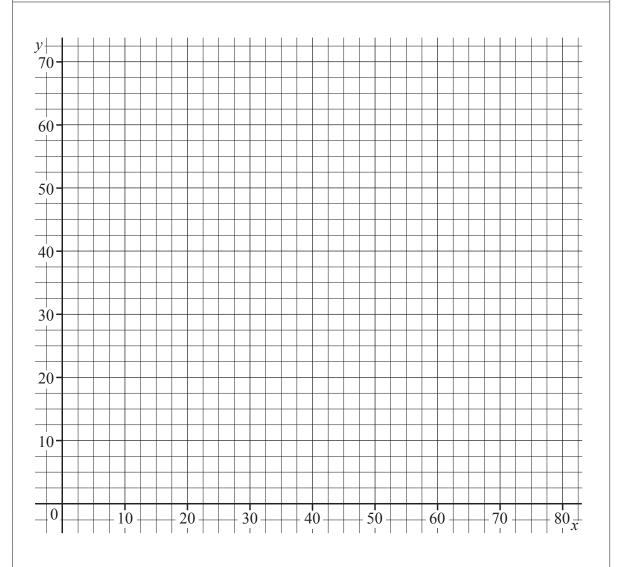
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| 6 | 0 | | | | | | | | | | | | | | | | | | | |
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| 5 | 0 | | | | | | | | | | | | | | | | | | | _ |
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| 4 | 0 | | | | | | | | | | | | | | | | | | | _ |
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| 3 | 0 | | | | | | | | | | | | | | | | | | | |
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| 2 | 0 | | | | | | | | | | | | | | | | | | | _ |
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| 5(c) | |
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| 5(d)(i) | |
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| 5 (4)(2) | |
| 5(d)(ii) | |
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| 5(e) | |
| 3(6) | |
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5(a) Spare copy of tableau for Q5(a)

| Q | P | x | у | Z | <i>s</i> ₁ | s_2 | s_3 | s_4 | <i>s</i> ₅ | a_1 | RHS |
|---|---|---|---|---|-----------------------|-------|-------|-------|-----------------------|-------|-----|
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5(b) Spare copy of graph for Q5(b)



ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).



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