Oxford Cambridge and RSA

## GCE

## Mathematics (MEI)

Unit 4771: Decision Mathematics 1<br>Advanced Subsidiary GCE

Mark Scheme for June 2018

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.
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## Annotations and abbreviations

| Annotation in scoris | Meaning |
| :--- | :--- |
| $\checkmark$ and $\mathbf{x}$ |  |
| BOD | Benefit of doubt |
| FT | Follow through |
| ISW | Ignore subsequent working |
| M0, M1 | Method mark awarded 0, 1 |
| A0, A1 | Accuracy mark awarded 0, 1 |
| B0, B1 | Independent mark awarded 0, 1 |
| SC | Special case |
| ^ | Omission sign |
| MR | Misread |
| Highlighting |  |
|  |  |
| Other abbreviations in <br> mark scheme | Meaning |
| E1 | Mark for explaining |
| U1 | Mark for correct units |
| G1 | Mark for a correct feature on a graph |
| M1 dep* | Method mark dependent on a previous mark, indicated by * |
| cao | Correct answer only |
| oe | Or equivalent |
| rot | Rounded or truncated |
| soi | Seen or implied |
| www | Without wrong working |
|  |  |
|  |  |


| Question |  | Answer | Marks | Guidance |
| :---: | :---: | :---: | :---: | :---: |
| 1 | (i) |  | $\begin{aligned} & \text { B1 } \\ & \text { B1 } \end{aligned}$ | 10 vertices correct <br> 17 arcs correct |
|  | (ii) | 4 odd vertices, C, SQ, M, and TS, so neither Eulerian nor semi-Eulerian, | M1 A1 | ... odd vertices or neither Eulerian nor semiEulerian noting 4 or identifying 4. |
|  | (iii) | Two adjacent odd nodes | B1 |  |
|  | (iv) | Starting and finishing at odd nodes other than those in (iii). | B1 |  |
|  | (v) | eg TS BS TS P ST CP P CT BS C SQ M SQ CT M CP M B C eg TS BS TS P ST CP M CP P CT BS C SQ CT M SQ C B M | M1 <br> A1 | 18 arcs repeating only as per (iii) <br> starting and finishing as per (iv) |




| Question |  |  | Answer |  |  |  |  |  |  | Marks | Guidance |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 4 | (i) <br>  <br> (ii) |  | Minimum completion time $=60 \mathrm{mins}$ <br> Critical activities are E, F, J and K. |  | $30$ | $45$ | $45$ | $\stackrel{\mathrm{K}}{15} \leftrightarrows 60$ | $60$ | M1 <br> A1 <br> A1 <br> A1 <br> A1 <br> M1 <br> A1 <br> M1 <br> A1 <br> B1 <br> B1 | activity on arc <br> A, B, C, D, E <br> F and H <br> G, I, J <br> K <br> forward pass <br> backward pass |
|  | (iii) |  | eg (earliest times) |  |  |  |  |  | son 1 <br> son 2 <br> th <br> body | B1 <br> B1 <br> B1 <br> B1 | 4 types indicated and used timing of $\mathrm{E}, \mathrm{F}, \mathrm{J}$ and K $\mathrm{A}, \mathrm{B}, \mathrm{C}$ and D correct G, H, I correct |
|  | (iv) |  | Explanation in terms of nature of critical acti | vities, | which cann | be s | rte |  |  | B1 |  |





|  | Ques | Answer | Marks | Guidance |
| :---: | :---: | :---: | :---: | :---: |
| 6 | (i) | Let H be the number of acres sold (for housing). <br> Let $R$ be the number of acres developed (for recreational use). $\begin{aligned} & \mathrm{H}+\mathrm{R} \leq 50 \\ & \mathrm{H} \leq 10 \end{aligned}$ <br> $0.015(200000 \mathrm{H}-5000 \mathrm{R}) \geq 500 \mathrm{R}$ (ie $\mathrm{H} \geq(575 / 3000) \mathrm{R} \ldots$ approximately $\mathrm{H} \geq 0.192 \mathrm{R}$ ) | $\begin{aligned} & \text { M1 } \\ & \text { A1 } \\ & \text { A1 } \\ & \text { A1 } \\ & \text { B1 } \\ & \text { B1 } \end{aligned}$ | identification of variables definition <br> LHS <br> RHS |
| 6 | (ii) |  | B1 <br> B1 <br> B1 <br> B1 <br> B1 | axes labelled and scaled $\begin{aligned} & H=10 \text { cao } \\ & H+R=50 \text { cao } \\ & 3000 H=575 R \text { cao } \end{aligned}$ <br> Correct shading for first two inequalities cao |


| Question |  | Answer | Marks | Guidance |
| :---: | :---: | :---: | :---: | :---: |
| 6 | (iii) | $\begin{aligned} & \mathrm{R}=0 \text { and } \mathrm{H}=0 \\ & \mathrm{R}=0 \text { and } \mathrm{H}=10 \end{aligned}$ <br> Sell to max amount and develop the rest. $(\mathrm{R}=40$ and $\mathrm{H}=10)$ <br> Develop to max with selling the rest. ( $\mathrm{R}=42$ and $\mathrm{H}=8$ (approx)) | B1 <br> B1 <br> B1 $\sqrt{ }$ | for both points |
| 6 | (iv) | Intersection of $3000 \mathrm{H}=575 \mathrm{R}$ and $\mathrm{H}=10$ (gives $\mathrm{R} \approx 52.17$ ) So sell 10 and develop 52 (approx) leaving 3 untouched. | M1 <br> A1cao | 52 |

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