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EDEXCEL - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN

January 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject **DECISION MATHEMATICS 6689** Paper No. **D1**

Question number	Scheme	Marks

Q1) (a)

	1 Office	2 A	6 B	4 C	5 D	3 E
~~Office~~	—	~~8~~	~~16~~	~~12~~	~~10~~	~~14~~
~~A~~	(8)	—	~~14~~	~~13~~	~~11~~	~~9~~
~~B~~	~~16~~	~~14~~	—	~~12~~	~~15~~	(11)
~~C~~	~~12~~	~~13~~	~~12~~	—	~~11~~	(8)
~~D~~	(10)	~~11~~	~~15~~	~~11~~	—	~~10~~
~~E~~	~~14~~	(9)	~~11~~	~~8~~	~~10~~	—

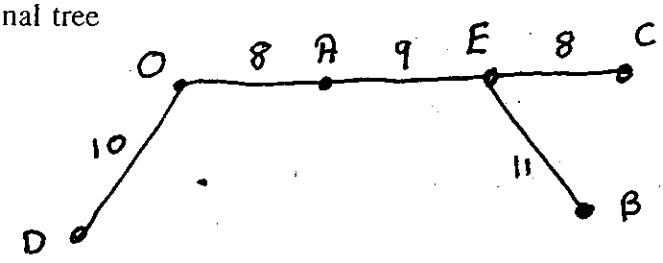
M1 A1
OA, AE
(in order)

M1 A1
rest
(in order)

Order of selecting edges

OA, AE, EC, OD, EB

Final tree



A1

(5)

(b) Minimum total length of cable.

10 + 8 + 9 + 8 + 11 = 46

B1√(1)
f.t. from tree/table

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(2)	(a) As there are 11 names in the list the middle location is $[\frac{1}{2}(11+1)] = 6$ is JONES	
	Comparison 1: HUSSAIN occurs before JONES	M1 A1
	So list 2 is 1. ALLEN, 2. BALL, 3. COOPER 4. EVANS, 5 HUSSAIN.	
	middle is now $[\frac{1}{2}(1+5)] = 3$ is COOPER	A1
	Comparison 2: HUSSAIN occurs after COOPER	M1 A1
	so list 3 is 4. EVANS, 5 HUSSAIN	
	middle is now $[\frac{1}{2}(4+5)] = 5$	
	Comparison 3 HUSSAIN has been found at position 5	A1 (6)
	(b) Maximum number of comparisons with a list of 11 names is 4	B1 cao (1)
		7

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Question number	Scheme	Marks
(3)	(a)	

vertex	A	B	C	D	E	F
valency	3	2	4	3	3	3

Odd vertices are A, D, E and F. — B1 cao

Possible pairings	Shortest routes	Total	
(A, F) and (D, E)	AF + DE (60) + (90)	150*	
(A, E) and (D, F)	AFGE + DGF (170) + (70)	240	
(A, D) and (E, F)	ACD + EGF (120) + (110)	230	M1 A1

So repeat AF and DE — A1√

Possible route A F E D E G D C B A C G F A — A1√ (5)

(b) Total length of this route

= Total weight of edges + 150 — M1

= 690 + 150 = 840 m — A1√ (2)

[7]

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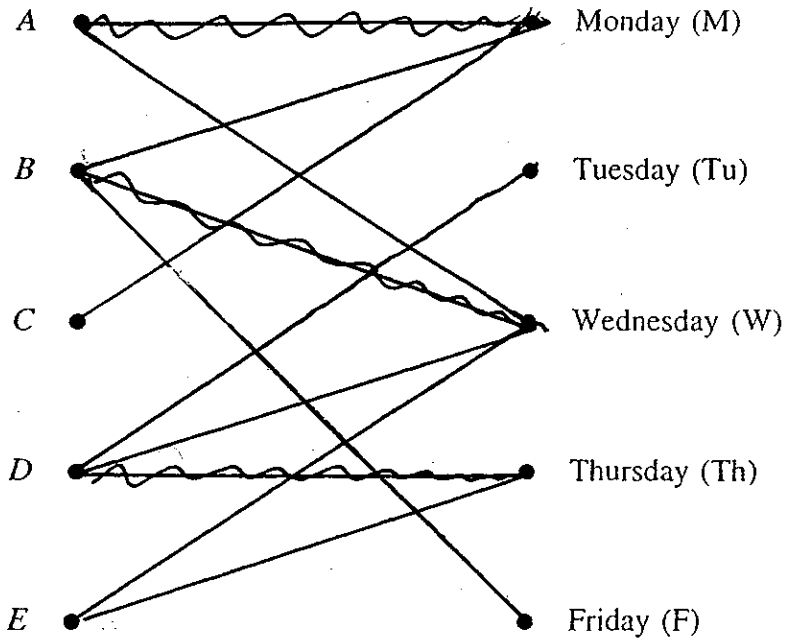
(4)

MARKS.

(a)



B1

B1 (2)

(b) $C - M = A - W = B - F$ (break through)

Changing status

$C = M - A = W - B - F$

M1 A1

Matching now $D = Th$, $C = M$, $A = W$, $B = F$

A1 (3)

(c) $E - Th = D - Tu$

Changing status

$E = Th - D = Tu$

M1 A1

So complete matching is

$A = W$, $B = F$, $C = M$, $D = Tu$, $E = Th$ A1 (3)

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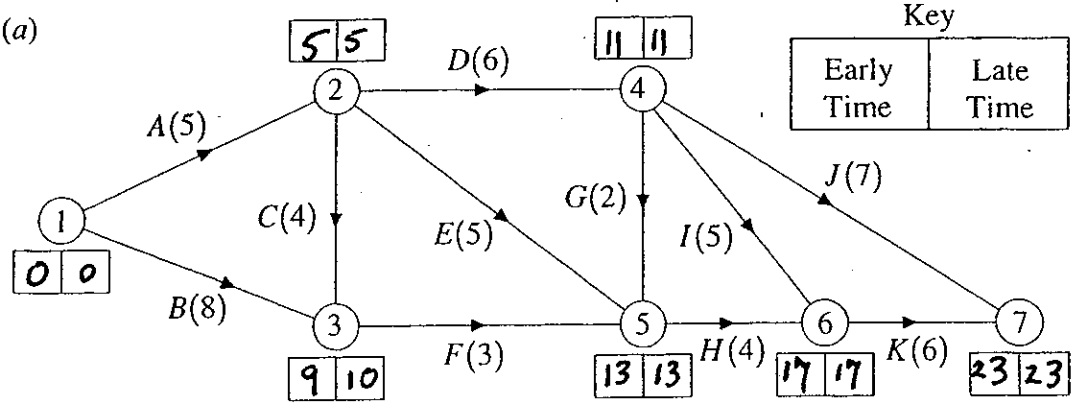
(5)

MARKS

(a)



$e_1 = 0$, $e_2 = 5$, $e_3 = 9$

$e_4 = 11$, $e_5 = \max(10, 12, 13) = 13$

$e_6 = \max(16, 17) = 17$, $e_7 = \max(18, 23) = 23$

$l_7 = 23$, $l_6 = 17$, $l_5 = 13$

$l_4 = \min(16, 12, 11) = 11$, $l_3 = 10$

$l_2 = \min(6, 8, 5) = 5$, $l_1 = \min(2, 0) = 0$

B1

M1 A1

B1

M1 A1 (6)

(b) Critical activities A, D, G, H, K

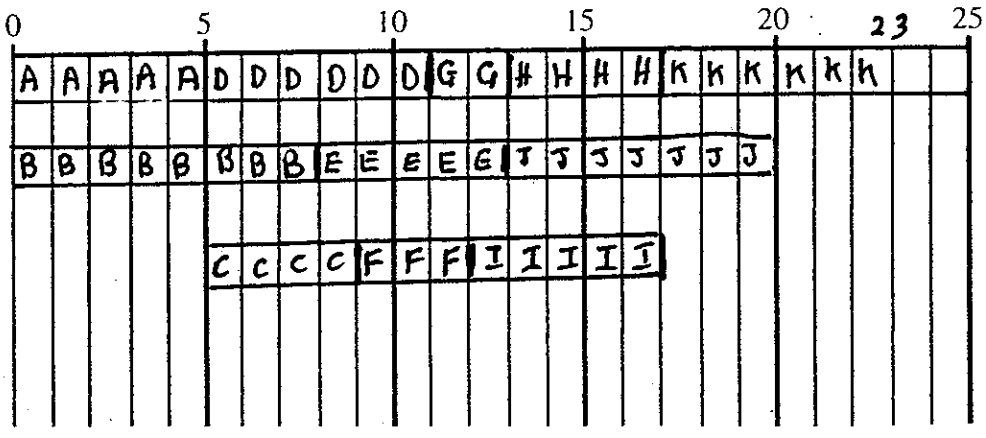
A1✓

Length of critical path $5 + 6 + 2 + 4 + 6 = 23$

A1✓

(2)

(c)



M1 A1

M1 A2 -1ee

(5)

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(6)

(a) (i) *SAET* ..... 5 ..... B1 cao

(ii) *SBDT* ..... 4 ..... B1 cao

(iii) *SCFT* ..... 3 ..... B1 cao (3)

(b)

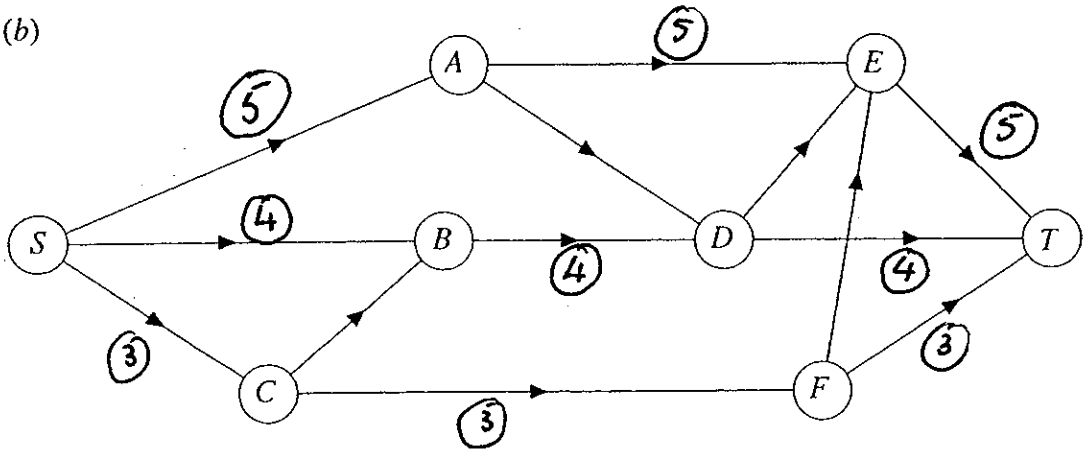

Diagram 1

B1 (1)

(c)

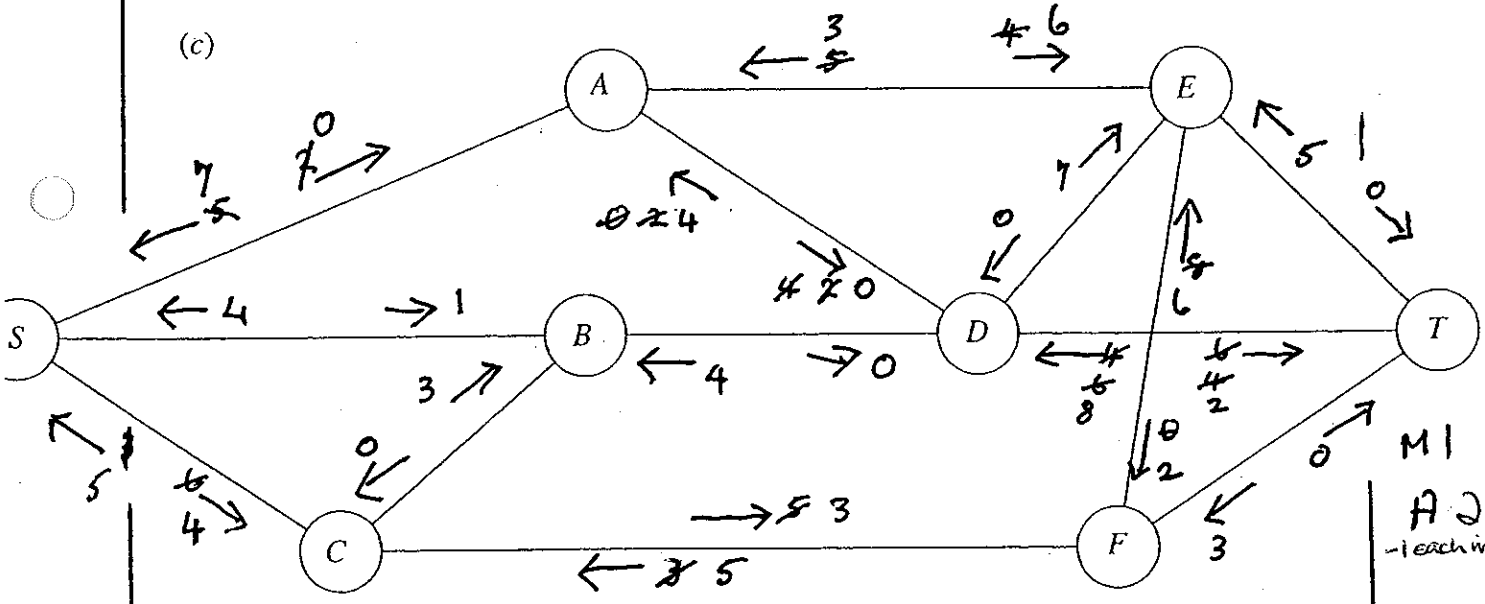

Diagram 2

M1

A2 -1 each incorrect arc

Flow augmenting routes

S A D T flow 2 ..... B1

S C F E A D T flow 2 ..... B1

Total flow 12 + 2 + 2 = 16 A1 (6)

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Question number	Scheme	Marks

6 contd

(d)

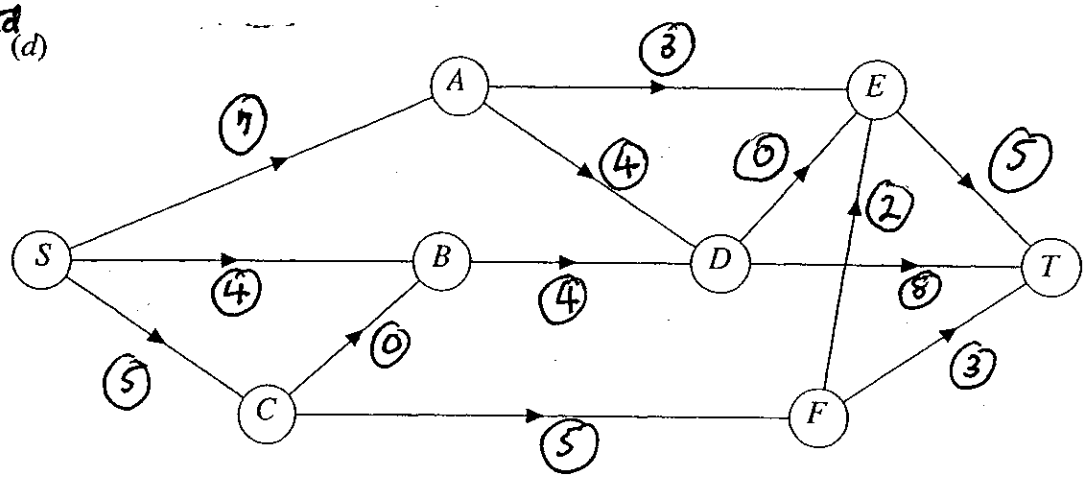

Diagram 3

M1 A1√ (2)

(e) There is a cut of capacity 16 consisting of ET, FT, AD and BD

[Alt: ET is saturated and FT is saturated Only possible route to T is then DT. But as AD and BD are saturated no flow into D is possible]

M1 A1 (2)

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Question number	Scheme	Marks
(7) (a)	Cotton $1.x + 2y \leqslant 70$ (available) Wool $3.x + 2.y \leqslant 90$ (available) Non negativity $x \geqslant 0, y \geqslant 0$.	B1 B1 (2)
(b)	Income £P where $P = 30x + 40y$ Objective to maximise P Adding slack variables r and s $x + 2y + r = 70$ $3x + 2y + s = 90$ So initial tableau is	M1

Basic Var	x	y	r	s	Value
r	1	(2)	1	0	70 ←
s	3	2	0	1	90
P	-30	-40	0	0	0

↑

A1

A1 (3)

(c) Θ values row 1: $70/2 = 35$ *
row 2: $90/2 = 45$
So ringed (2) is pivot

M1 A1

Second tableau is then

Basic Var	x	y	r	s	Value
y	½	1	½	0	35
s	(2)	0	-1	1	20 ←
P	-10	0	20	0	1400

↑

M1 A1

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Question number	Scheme	Marks
4 (contd)	⊖ values row 1 : $35/\frac{1}{2} = 70$ row 2 : $20/2 = 10$ * so ringed ② is pivot Third tableau is	M1 A1

Basic Var	x	y	r	s	Value
y	0	1	3/4	−1/4	30
x	1	0	−1/2	1/2	10
P	0	0	15	5	1500

A1

So $x = 10$, $y = 30$, $P = 1500$ A1√(8)

(d) $x + 2y = 70$ goes through (0, 35) (70, 0)
$3x + 2y = 90$ goes through (0, 45) (30, 0) M1 A1
So A is (0, 35) D is (30, 0)
C is given by $x + 2y = 70$
and $3x + 2y = 90$ M1 A1
so $x = 10$ and $y = 30$ (4)

(e) Initial tableau relates to O ($x = 0, y = 0, P = 0$) B1

Second tableau relates to A ($x = 0, y = 35$, $P = 1400$) B1

Third tableau relates to C ($x = 10, y = 30$, $P = 1500$) B1 (3)

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