

THE HONG KONG POLYTECHNIC UNIVERSITY
HONG KONG COMMUNITY COLLEGE

Subject Title : Introduction to Management Science
Subject Code : CCN2158
Session : Semester Two, 2017/18

Numerical Answers

Question A1

(b) 26

Question A2

- (a) 80%
- (b) 0.8
- (c) 4
- (d) 32 minutes
- (e) 40 minutes

Question A3

$X_1 = 10$ and $X_2 = 15$ with objective function value is 215.

Question A4

$Y_1 = 0$, $Y_2 = 0$, $Y_3 = 10$ and $Y_4 = 0$ with the optimal function value is 30.

Question A5

11

Question A6

- (a) 1500
- (b) 288
- (c) 20.83
- (d) 72720

Question B1

- (a) $a=2; b=5; c=10$
- (c) $X_1= 380$, $X_2= 10$ and $X_3 = 0$ with the optimal objective value is 810
- (d) the range of optimality for X_1 is $[1.875, 2.5]$; the range of optimality for X_2 is $[4, 5.5]$; range of insignificant for X_3 is less than or equal 12.

- (e) The shadow price for first constraint is 1.5 with sensitivity range [210,420].
The shadow price for third constraint is 0.25 with sensitivity range [800,1600].

Question B2

(b)

Activity	t	ES	EF	LS	LF	slack
A	2	0	2	0	2	0
B	5	0	5	8.5	13.5	8.5
C	3	2	5	14.5	17.5	12.5
D	11.5	2	13.5	2	13.5	0
E	6.5	13.5	20	17.5	24	4
F	16.5	13.5	30	13.5	30	0
G	8.5	20	28.5	24	32.5	4
H	3.5	28.5	32	32.5	36	4
I	4.5	20	24.5	31.5	36	11.5
J	6	30	36	30	36	0
K	4	36	40	36	40	0

- (d) Expected project complete time = 40
Overall variance = 125/6 (or 20.83) and overall standard deviation = 4.564

Activity	Standard deviation
A	1/3
B	1
C	2/3
D	3.5
E	1.5
F	2.5
G	1.5
H	5/6
I	5/6
J	4/3
K	2/3

- (e) $P(X \leq 50) = P\left(Z \leq \frac{50 - 40}{4.564}\right) = P(Z \leq 2.19) = 0.9857$ (or 0.99)

Question B3

- (d) $p = 0.5221$ where p is the probability of positive survey result.

Question B4

- (b) $X_1 = 1$ and $X_2 = 6$ with optimal objective function value is 1000.