Assignment 2 :-

Question 1

1) 4 different chromosomes:-

objects:-

	A	B	C	D	E	F	G	weight
a)	1	0	1	0	0	0	1	15
b)	0	1	1	1	0	0	0	15
c)	1	0	0	0	0	1	1	14
d)	1	1	1	0	1	1	0	15

2) fitness function based on profit

For a) 1 0 1 0 0 0 1 = 10 + 5 + 8 = 23

b) 0 1 1 1 0 0 0 = 5 + 15 + 7 = 27

c) 1 0 0 0 0 1 1 = 10 + 18 + 10 = 38 ✓

d) 1 1 1 0 1 1 0 = 10 + 5 + 15 + 6 + 18 = 54. ✓

2 fittest ones are

∴ ~~choose~~ (c) & (d)

3) Performing single point crossover:-

1 0 0 | 0 0 1 1 → 1 0 0 0 1 1 0 offspring 1

1 1 1 | 0 1 1 0 → 1 1 1 0 0 1 1 offspring 2.

4) Performing mutation:-

		Profit
1 0 0 0 1 1 0	→ 1 0 0 0 1 1 0 1	= 10 + 6 + 18 + 10 = 44
1 1 1 0 0 1 1	→ 1 0 1 0 0 1 1	= 10 + 15 + 18 + 10 = 53

offspring 1 → fitness = 44

offspring 2 → " = 53.

Question 3

1.)

Cities	Encoding
A	000
B	001
C	010
D	100
E	101
F	110

8 different chromosomes:-

a.) A → B → C → D → E → F
000 001 010 100 101 110

b.) B → F → D → E → C → A
001 110 100 101 010 000

d.) A → C → F → E → D → B
000 010 110 101 100 001

2.) For fitness function, I will consider the least path cost.

a.) A → B → C → D → E → F = 2 + 3 + 3 + 1 + 4 = 13 ✓

b.) B → F → D → E → C → A = 15 + 6 + 1 + 6 + 4 = 32

c.) A → C → F → E → D → B = 4 + 11 + 9 + 6 + 5 = 35 ✓

Two fittest ~~best~~ once are (a) & (c)

3.) Crossover :-

000	001	010	100	101	110	→	000 001 010 100 101 110
000	010	110	101	100	001	→	000 010 110 100 101 001

offspring 1 → A → B → C → E → D → B

" 2 → A → C → F → D → E → B

~~They are not exactly~~
One of them is eligible and the other one is not since the other one does not ~~fi~~ meet the ~~condition of~~ two conditions:-

i) visiting every city once only.
ii) visiting all 6 cities.

4) Choosing → (a) 000 001 010 100 101 110

i) Genes are 000, 001, 010, 100, 101, 110
ii) Chromosome :- 000001010100101110.

Question 3

1) Yes, because It searches for a population of points and not a single point. Also genetic algorithm support multi-objective optimization.

2.)

	Initial population M N O P Q R	weight.
(a)	1 0 1 1 0 1	21
(b)	1 1 0 1 1 0	20
(c)	1 1 1 0 1 1	19
(d)	0 0 1 1 0 0	19.

3.) fittest 2 chromosone:-

		Profit
For a. (a)	101101	35 ✓
(b)	110110	28
(c)	111011	39 ✓
(d)	001110	28

two fittest ones are:- (a) & (c)

4.) Crossover & mutation

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1 0 1 | 1 0 1  ->  1 0 1 0 1 1   offspring 1
1 0 1 | 0 1 1  ->  1 1 1 1 0 1   offspring 2.
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Profit

1 0 [1] 0 1 1 → 1 0 0 0 1 1 → 10 + 6 + 3 = 19

1 1 1 [0] 1 → 1 1 1 1 1 1 → 46

∴ offspring 2 is the most fittest.