

Exercice 1 (07 points)

- 1)  $\text{Length}(ABCD)=5+2+4+1=12$  ;  $\text{Length}(ABDC)=5+5+4+2=16$  .....1
- 2)  $\text{TAU}(AB)=0.75*1+12/12+12/16=0.75+1+0.75=2.5$   
 $\text{TAU}(CD)=0.75*1+12/12+12/16=0.75+1+0.75=2.5$   
 $\text{TAU}(AC)=0.75*1+12/16=0.75+0.75=1.5$   
 $\text{TAU}(BD)=0.75*1+12/16=0.75+0.75=1.5$   
 $\text{TAU}(AD)=0.75*1+12/12=0.75+1=1.75$   
 $\text{TAU}(BC)=0.75*1+12/12=0.75+1=1.75$  .....3
- 3) - .....2.5

```

Void UpdatePheromobe() {
    For (ant =0 ; ant <m ;ant++)
        For (i=0 ;i<n-1 ;i++)
            Delta[tour[i]][tour[i+1]] += Q/Length(tour(ant));
            Delta[tour[n-1]][tour[0]]+= Q/Length(tour(ant));
        For (i=0 ;i<n ;i++)
            For (j= 0 ;j< i ;j++)
                Tau[i][j] =(1-ro) *Tau[i][j]+Delta[i][j];
    }
    
```

Complexité =  $O(n.m)$  .....0.5

Exercice 2 (04 points)

- 1)  $\begin{cases} \max f(x) = |x^3 + 2x - 100| \\ x \in N, 1 \leq x \leq 50 \end{cases}$  .....1.5
- 2) PSO, Taille de l'essaim =m ; Nombre d'itérations = MaxIter ;  $c1=0.5$  ;  $c2=0.5$  ;  $\omega=0.9$  .....1.5
- 3)  $O(\text{MaxIter}*m)$  .....0.5
- 4) Cet algo calcule les entiers x compris entre 1 et 50 tels que  $x^3 + 2x \approx 100$  .....0.5

Exercice 3 (09 points)

- 1) - .....3.5

Individu	fitness	Rank	Proba
x1	25	2	0.2
x2	30	4	0.4
x3	16	1	0.1
x4	29	3	0.3
		10	1

```

b) Int Selected(){
    s1=SumRank*Random(0,1);
    s=0;
    k=0;
    While (s < s1)
        { s+=Rank(Pop[k]); k++;}
    Return k;} .....2
    
```

- 2) -

```

a) Int Rank(x){
    r=0;
    For(j=0 ;j<m ;j++)
        If (f(Pop[j])< f(x)) r++;
    Return r;} .....1.5
    
```

```

c) Void Selection(){
    SumRank=0
    For(j=0 ;j<m ;j++)
        SumRank+=Rank(Pop[j]);
    For(j=0 ;j<m ;j++)
        Pop1[j]=Pop[Selected];} .....2
    
```