

Artificial Intelligence
QUIZ 1 (Section-A)

Date: November 19, 2018

Marks: 50

Time: 30 min.

Q1. a. Implement **k-means algorithm** on the data given in Figure 1. The value of k is 2. Use Manhattan distance as the distance measure. Run two complete iterations. (30)

Individual	Variable 1	Variable 2
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

Figure 1

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Q2.a. Suppose there are 10 chromosomes with fitness as shown in table. What will be the selection probability according to proportionate and linear rank selection methods? 10)

Chromosome No.	Fitness	Proportionate	Linear Rank
A	50		
B	25		
C	25		
D	100		
E	75		
F	125		
G	250		
H	110		
I	140		
J	100		

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b. If two parents are to be selected from the above population by tournament selection and the two randomly selected chromosome sets are {A, D, H} and {C, D, J}, which two chromosomes will be selected as parents? (3)

Solution:

Good Luck

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a. In genetic algorithm, a generation has 50 chromosomes, out of which 5 fittest ones are placed in the next generation without any competition from the offspring. The rest of the 45 chromosomes of the next generation are chosen from the pool of parents and offspring. Suppose 30 chromosomes of the offspring make it to the new generation. What is the generation gap and what is the elitism value. Duplicates are not allowed. (10)

b. Give optimal chromosome encoding [Geno-type and Pheno-type] (Binary chromosome)?
(10) Size of chromosome? (5)

- Courses = 16 (C1, C2, C3,.....C16)
- Classrooms = 4 (R1, R2, R3, R4)
- Days = 5 (Mon, Tues, Wed, Thurs, Fri)
- Time-Slots = 5 (9-10, 10-11, 11-12, 12-1, 1-2)
- Teachers = 8 (T1, T2, T3,.....T8)

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Q2. Show the mathematical working of Artificial Neural Network by taking the case in figure below. First two columns are the input values for X1 and X2 and the third column is the desired output. (20)

- Learning rate = 0.2
- Threshold = 0.5
- Actual output = $W_1X_1 + W_2X_2$
- Next weight adjustment = $W_n + \Delta W_n$
- Change in weight (ΔW_n):
- $\Delta W_n = \text{learning rate} * (\text{desired output} - \text{actual output}) * X_n$
- In Figure. First two columns are input vectors x1 and x2 and last column is the desired output y.

0	0	0
0	1	0
1	0	1
1	1	1

Show the complete iterations for acquiring the desired output?

<u>x1</u>	<u>x2</u>	<u>w1</u>	<u>w2</u>	<u>d</u>	<u>y</u>	<u>$\Delta w1$</u>	<u>$\Delta w2$</u>
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