Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2017

Level : B.E.
Year : IV
Course : ETEG 428
Semester : II
Exam Roll No. :
Time : 30 mins.
F. M. : 10
Registration No. :
Date AUG 2 5 2017

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Tick the most appropriate answer for each of the questions below.

1. Which of the following is not a guided random search technique?
[a] Compact Genetic Algorithm [b] Simulated Annealing
[c] Gradient Descent [d] Ant Colony Optimization

2. _____ enhances the performance of local search by accepting a worse solution when a better solution is not available and by avoiding previously visited solutions.
[a] Ant Colony Optimization [b] Tabu Search
[c] Particle Swarm Optimization [d] Genetic Algorithm

3. Learning process of Artificial Neural Network involves updating the _____ of the neurons.
[a] weights [b] thresholds [c] activation functions [d] sizes

4. Which of the following statements regarding GA is false?
[a] Cyclic crossover is a reordering operator.
[b] A schema may be destroyed during crossover.
[c] GA uses probabilistic transition rules, not deterministic rules.
[d] GA can always find a global optimum within a given time.

5. In SGA, _____ is generally followed by _____.
[a] mutation; crossover [b] crossover; reproduction
[c] reproduction; crossover and mutation [d] crossover; mutation and reproduction

6. Schemata of low defining length, low order and high fitness are regarded as _____ in GA.
[a] sub-optimal solutions [b] micro-operators
[c] building blocks [d] chromosomes

7. Suppose, in SGA, the chromosome length is 18 and the mutation probability is 0.01. Probability that a chromosome undergoes mutation is _____
[a] 0.001 [b] 0.165 [c] 0.18 [d] 0.835

8. Binary search algorithm has _____ time complexity.
[a] Linear [b] Quadratic [c] Logarithmic [d] Exponential

9. The order and defining length of the schema *11**0* are _____ and _____ respectively.
[a] 3; 5 [b] 5; 4 [c] 2; 6 [d] 3; 4

10. Suppose, two parents, 0101 and 1010, undergo crossover using single crossover point. If there is no mutation, the probability that one of the two offspring would be 0000 is _____.
[a] 0 [b] 0.25 [c] 0.5 [d] 1

11. The _____ rate controls the speed of GA in exploring a new area whereas, the _____ rate controls the capability of GA in exploiting a located hill to reach the optimum.
[a] mutation; crossover [b] reproduction; mutation
[c] crossover; mutation [d] crossover; convergence

12. Survival probability of a schema during reproduction doesn't depend on _____.
[a] defining length of the schema [b] count of the schema
[c] average fitness of the schema [d] average fitness of the population

13. The slope and the second derivative of a function are respectivelyzero and negative at:
[a] minima [b] maxima [c] local extrema [d] global extrema

14. In GA, polyploidy is useful in optimizing _____ problems.
[a] Multimodal [b] Time-variant [c] Multi-objective [d] Time-invariant

15. Compact GA isconsidered to be converged when each element of the probability vector is:
[a] 0 [b] 1 [c] 0.5 [d] 0 or 1

16. Which of the following methods can be used to avoid premature convergence in GA?
[a] Dominance [b] Partially matched crossover
[c] Close relative breeding avoidance [d] Inversion

17. _____ increases the effective mutation rate even when the background mutation rate remains constant.
[a] Deletion [b] Duplication [c] Speciation [d] Inversion

18. _____ refersto a situation when the circumstances of one individual cannot be made better without making the situation worse for another individual.
[a] Sub-optimality [b] Local-optimality [c] Co-optimality [d] Pareto-optimality

19. In Simulated Annealing, the probability of accepting a worse neighbor is highest at the _____.
[a] beginning [b] middle [c] end [d] beginning and end

20. In GA, if a fitness (f) is scaled such that the scaled fitness, $f' = 2f$, then, the probability of a chromosome with above average fitness being selected during reproduction _____.
[a] increases [b] decreases
[c] remains unchanged [d] becomes twice of that with lower fitness

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SECTION "B"

Attempt *ANY FIVE* questions. Missing data may be suitably assumed.

Q. 1 **[2+ 5 + 1]**

a. Discuss the merits and demerits of Genetic Algorithms.
b. A function of three independent variables is to be minimized. Each of the inputs is a non-negative integer of size 16 bits and the output is known to vary somewhere between -18 to -2. Write a Simple Genetic Algorithm,with the population size of 50, to solve the minimization problem.
c. What do you understand by Segregation?

Q. 2 **[3 + 3 +2]**

a. Explain how GA can be used in solving multi-objective optimization problems.
b. Discuss the advantages of Sharing with the help of suitable examples.
c. Distinguish between Genetic Algorithm and Genetic Programming. Give an example of each.

Q. 3 **[3 + 3 + 2]**

a. How does the choice of fitness scaling function, crossover rate and mutation rate affect the convergence of Genetic Algorithms? Explain.
b. Suppose, aninitial GA population of size 80 contains 12 chromosomes with the schema *1**01*. Average fitness of the schema is 235, whereas the average fitness of the population is 129. The crossover and mutation rates are 0.9 and 0.01 respectively. What would be the expected count of the schema in the subsequent generation if the entire population is replaced by the offspring?
c. What do you understand by Computational Complexity? Distinguish between Time Complexity and Space Complexity.

Q. 4 **[4 + 3+ 1]**

a. Explain the working of Simulated Annealing with the help of a suitable example. Also, compare it with Gradient Search and Blind Random Search.
b. Realize a 2-input XNOR function using Artificial Neural Network and explain its working.
c. Distinguish between Classification and Clustering.

Q. 5 **[2+ 4 + 2]**

a. Discuss the Building Block Hypothesis.
b. Explain the working of Compact Genetic Algorithm and compare it with Simple Genetic Algorithm.
c. Distinguish between Elimination and Round-robin tournaments. Give an example of each.

Q. 6 **[4 + 2 + 2]**

a. With the help of a suitable flowchart or pseudocode, illustrate the use of a reordering operator in solving a Travelling Salesman Problem with 8 nodes.
b. Explain how the Ant Colony Optimization can be used to solve a Travelling Salesman Problem.
c. Discuss the significance of Genetic Algorithms in Machine Learning.