School of Information Technology
Indian Institute of Technology, Kharagpur

IT 60108: Soft Computing Applications
Class test -II
Spring, 2015-2016

Maximum Marks: 30   Time: 30 minutes

Instructions:

1.   Attempt **ALL** questions.

2.   All questions are of multiple choice type. Each question has **ONLY ONE** option as correct.

3.   For each correct choice **ONE** mark will be awarded.

4.   There is NO negative marking.

_____

Name: _____ Roll No: _____Mobile: _____

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For Office/ internal use only:

S.No	Option	Total		Marks
1.	Number of correct answers.		(x 1)	
2.	Number of wrong answers.			
3.	Number of questions not attempted.			
	Grand Total			

1. Which GA operation is computationally most expensive?

(a) Initial population creation.
(b) Selection of sub-population for mating.
(c) Reproduction to produce next generation.
(d) Convergence testing.

2. Which selection strategy is susceptible to a high selection pressure and low population diversity?

(a) Roulette-wheel selection.
(b) Rank based selection.
(c) Tournament selection.
(d) All of the above.

3. What GA encoding scheme suffers from Hamming cliff problem?

(a) Binary coded GA.
(b) Real coded GA.
(c) Order GA.
(d) Tree coded GA.

4. Which of the following is true with respect to Steady State Genetic Algorithm?

(a) Generation gap is high.
(b) Convergence rate is slow.
(c) Same selection strategy as in Simple Genetic Algorithm.
(d) Different reproduction strategy as in Simple Genetic Algorithm.

5. Assume that chromosome length is same as Binary coded GA. Which crossover technique is fastest?

(a) Uniform crossover.
(b) Multi-point crossover.
(c) Half uniform crossover.
(d) Shuffle crossover.

6. Which of the following is not a mutation operation in real coded GA?

(a) Flipping.
(b) Random mutation.
(c) Polynomial mutation.
(d) Node swapping.

7.   The scaling of fitness value is used to

(a)   Reduce selection pressure and increase population diversity.
(b)   Reduce both selection pressure and population diversity.
(c)   Increase population diversity only.
(d)   Reduce selection pressure only.

8.   A solution space for a 2-objective optimization problem is shown in the following graph.
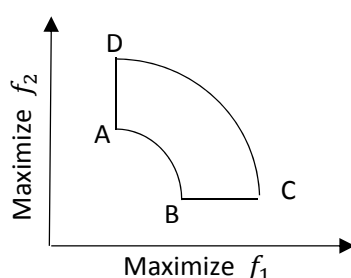
All trade-off solutions lie in the front

(a)   AB.
(b)   CD.
(c)   AB + AD.
(d)   BC + CD.

9.   A three-objective optimizations are solved using a MOEA algorithm and a few objective vectors are listed below.
(Assume all objectives are to be minimized)
$[3, 5, 10], [5, 3, 10], [3, 10, 5], [10, 5, 3], [10, 3, 5]$. Which of the following is true?

(a)   All are non-dominating solutions.
(b)   Solution$[3, 5, 10]$ dominates all other solution.
(c)   Solution$[10, 5, 3]$ dominated by the solution$[3, 5, 10]$.
(d)   Solution$[3, 10, 5]$ dominates solution$[5, 3, 10]$.

10.   Which of the following solution is non-Pareto based a posteriori technique?

(a)   SOEA.
(b)   MOGA.
(c)   VEGA.
(d)   Lexicographic ordering.

11.   Which of the following MOEA techniques follows Tournament selection strategy?

(a)   Lexicographic ordering.
(b)   MOGA.
(c)   NPGA.

    (d)   NSGA.

12. Niche counts of two solutions x_1 and x_2 are 10, 20. This means that

    (a) x_1 is surrounded by more neighbors than that of x_2.
    (b) x_1 is surrounded by less neighbors than that of x_2.
    (c) x_1 would be less desirable to provide population diversity.
    (d) x_2 would be more preferable to provide population diversity.

13. Which of the following statement(s) is not correct?

    (a)   A set of solutions is called trade-off solutions, which lie on the Pareto optimal front.
    (b)   A solution is called a trade-off solution, if it is not dominated by any other solution in the solution space.
    (c)   A front is called Pareto-optimal front on which all optimal solutions lie.
    (d)   A front containing a non-dominated set of solutions obtained over an exhaustive search space is called Pareto optimal front.

14. Which of the following MOEA algorithm is based on the concept of "elitism"?

    (a)   MOGA.
    (b)   NPGA.
    (c)   NSGA.
    (d)   NSGA-II.

15. Which of the following Pareto-based techniques to solve a MOOP follows "ranking" followed by "fitness averaging"?

    (a)   MOGA.
    (b)   NPGA.
    (c)   NSGA.
    (d)   NSGA-II.

16. Which of the following statement is true?

    (a)   Computational complexity of NSGA is less than NSGA-II.
    (b)   Crowding selection in NSGA is an efficient selection than the stochastic selection in NSGA-II.
    (c)   A set of solutions, which are lying on the non-dominated front is selected for mating pool in both NSGA and NSGA-II.
    (d)   NSGA-II always gives better trade-off solutions than NSGA.

17. Two parent chromosomes in Order GA encoding scheme is given as follows:

			*						
1	2	3	4	5	6	7	8	9	10

			*						
10	9	8	7	6	5	4	3	2	1

A $K-point$ is selected at 4th location according to single point crossover technique. Which of the following off-spring is not possible?

(a)

1	2	3	4	10	9	8	7	6	5

(b)

7	8	9	10	6	5	4	3	2	1

(c)

10	9	8	7	1	2	3	4	5	6

(d)

5	6	7	8	9	10	1	2	3	4

18. Which one of the following is not necessarily be considered as GA parameters?

   (a) N, the population size.
   (b) $\in$, the obtainable accuracy.
   (c) μ_p, the mutation probability.
   (d) $\bar{f}$, the average fitness score.

19. What GA encoding scheme gives faster execution?

   (a) Binary coded GA.
   (b) Real coded GA.
   (c) Order GA.
   (d) Tree encoded GA.

20. A similarity between NPGA and NSGA is that

   (a) Both are based on the concept of ranking.
   (b) Both assign fitness values to the parent chromosomes prior to their selection for mating pool.
   (c) Both calculates niched count to maintain population diversity.
   (d) Both are computationally very expensive.

21. A difference between MOGA and NSGA is that

   (a) MOGA uses the concept of ranking whereas NSGA uses the concept of niching to assign fitness values to parent chromosomes.
   (b) MOGA assigns different fitness values to all solution with the same rank whereas NSGA assigns the same fitness value to all solutions belonging to the same front.
   (c) MOGA assigns the same fitness values to all solution with the same rank whereas NSGA assigns different fitness value to all solutions belonging to the same front.
   (d) MOGA yields more accurate Pareto front than NSGA.

22. In Crowding tournament selection, any two solution x_i and x_j having their ranks r_i and r_j and Crowding distances d_i and d_j, respectively. x_i will be winner if

(a) $r_i > r_j$
(b) $r_i \leq r_j$
(c) $r_i \neq r_j$ and $d_i < d_j$
(d) $r_i > r_j$ and $d_i > d_j$

23. Which of the following statement is <u>not</u> true?

(a) Both NSGA and NSGA-II are Pareto based approach.
(b) NSGA follows the concept of niched count whereas NSGA-II follows the concept of Crowding distance to preserve population diversity.
(c) Both NSGA and NSGA-II follow non dominated sorting.
(d) NSGA-II is faster than NSGA because NSGA assigns fitness values to solution whereas in NSGA-II, there is no fitness value assignment task.

24. In the following, only one statement is <u>correct</u>. Select the correct statement.

(a) Stochastic selection with remainder supports low selection pressure.
(b) Crowding tournament selection scheme supports low population diversity.
(c) There is no selection scheme in NPGA.
(d) In MOGA, Rank based selection can be applied to select parent chromosome for mating pool creation.

25. The purpose of the fitness evaluation operation is

(a) To check whether all individual satisfies the constraints given in the problem.
(b) To decide the termination point.
(c) To select the best individuals.
(d) To identify the individual with worst cost function.

26. If crossover between chromosomes in search space does not produce significantly different offspring, what does it imply? (if offspring consist of one half of each parent)

(i) The crossover operation is not successful.
(ii) Solution is about to be reached.
(iii) Diversity is so poor that the parents involved in the crossover operation are similar.
(iv) The search space of the problem is not ideal for GAs to operate.

(a) ii, iii & iv only.
(b) ii & iii only.
(c) i, iii & iv only.
(d) All of the above.

27. Which of the following is not a valid chromosomes in Order GA?

(a)

1	3	5	7	2	4	6	8

(b)

A	B	D	E	A	F	H	G

(c)

1	0	0	1	1	0	0	1

(d)

14.6	-23.4	177.23

28. Which of the following(s) is/are the pre-requisite(s) when Genetic Algorithms are applied to solve problems?

      (i)   Encoding of solutions.
      (ii)   Well-understood search space.
      (iii)   Method of evaluating the suitability of the solutions.
      (iv)   Contain only one optimal solution.

(a)   i & ii only.
(b)   ii & iii only.
(c)   i & iii only.
(d)   iii & iv only.

29. Which of the following comparison is true?

(a)   In the event of restricted access to information, GAs win out in that they require much fewer information to operate than other search.
(b)   Under any circumstances, GAs always outperform other algorithms.
(c)   The qualities of solutions offered by GAs for any problems are always better than those provided by other search.
(d)   GAs could be applied to any problem, whereas certain algorithms are applicable to limited domains.

30. Which of the following(s) is/are found in Genetic Algorithms?

      (i)   Evolution.
      (ii)   Selection.
      (iii)   Reproduction.
      (iv)   Mutation.

(a)   i & ii only.
(b)   i, ii & iii only.
(c)   ii, iii & iv only.
(d)   All of the above.