Chapter 2 Weighted Voting Systems:

1. How many players are there in the weighted voting system \([20: 7, 5, 4, 2, 2, 2, 1, 1]\)?
   A) 20  B) 28  C) 10  D) 9  E) None of these

2. What is the quota in the weighted voting system \([20: 7, 5, 4, 2, 2, 2, 1, 1]\)?
   A) 10  B) 28  C) 20  D) 9  E) None of these

3. In the weighted voting system \([12: 13, 7, 2]\)
   A) every player is a dictator
   B) P1 has veto power but is not a dictator
   C) there are no dictators
   D) P1 is a dictator.
   E) None of the above

4. In the weighted voting system \([q: 10, 8, 4]\) a strict majority of the votes is needed to pass a motion. The value of the quota \(q\) is
   A) 11  B) 10  C) 13  D) 12  E) None of the above

5. In the weighted voting system \([q: 10, 8, 5]\), the smallest possible value that the quota \(q\) can take is
   A) 14  B) 13  C) 12  D) 11  E) None of the above

6. In the weighted voting system \([q: 10, 8, 5]\), the largest possible value that the quota \(q\) can take is
   A) 10  B) 18  C) 5  D) 23  E) 25

7. In the weighted voting system \([21: 10, 8, 5, 3, 2]\), the total number of possible coalitions is
   A) 63  B) 31  C) 32  D) 16  E) None of the above

8. In the weighted voting system \([q: 6, 5, 4, 3, 2, 1]\) no player has veto power. The largest possible value that the quota \(q\) can take is
   A) 13  B) 17  C) 11  D) 15  E) None of the above

9. In the weighted voting system \([q: 6, 5, 4, 3, 2, 1]\) every player has veto power. The smallest value that the quota \(q\) can take is:
   A) 1  B) 7  C) 21  D) 20  E) None of these

Questions 10 through 13 refer to the weighted voting system \([12: 5, 5, 2, 2]\) and the Banzhaf definition of power.
(The four players are \(P_1, P_2, P_3,\) and \(P_4.\))

10. What is the weight of the coalition \(\{P_2, P_3, P_4\}\)?
    A) 12  B) 9  C) 10  D) 6  E) None of the above

11. Which members of the coalition \(\{P_1, P_2, P_3, P_4\}\) are critical?
    A) \(P_1\) only  B) None  C) \(P_1\) and \(P_2\)  D) All four players  E) None of the above

12. What is the total number of winning coalitions?
    A) 5  B) 1  C) 15  D) 3  E) None of the above

13. The Banzhaf power distribution of the weighted voting system is:
    A) \(P_1: 37.5\%; P_2: 37.5\%; P_3: 12.5\%; P_4: 12.5\%\)
    B) \(P_1: 25\%; P_2: 25\%; P_3: 25\%; P_4: 25\%\)
    C) \(P_1: 40\%; P_2: 40\%; P_3: 10\%; P_4: 10\%\)
    D) \(P_1: 40\%; P_2: 30\%; P_3: 20\%; P_4: 10\%\)
    E) None of the above
14. Which of the following is not a possible Shapley-Shubik power index for a player in a weighted voting system with 4 players?
   A) 1/3  B) 1/4  C) 1/5  D) 1/6  E) None of the above

15. In the weighted voting system [9: 8, 4, 2]
   A) P1 is a dictator  B) P1 has veto power but is not a dictator.
   C) every player is a dictator.  D) there are no dictators.  E) None of the above

16. In the weighted voting system [q: 30, 29, 16, 8, 3, 1] a two-thirds majority of the votes is needed to pass a motion. The value of the quota q is
   A) 58  B) 59  C) 30  D) 4  E) None of these

17. In the weighted voting system [q: 14, 10, 7, 3, 3], the smallest possible value that the quota q can take is
   A) 19  B) 18  C) 14  D) 37  E) None of these

18. In the weighted voting system [25: 14, 10, 7, 3, 3], the total number of possible coalitions is
   A) 127  B) 720  C) 64  D) 63  E) None of these

19. In the weighted voting system [q: 8, 5, 4, 1], every player has veto power. The value of the quota q is
   A) 8  B) 7  C) 18  D) 17  E) None of these

Questions 20 through 12 refer to the weighted voting system [19: 11, 8, 8, 5] and the Banzhaf definition of power. (The four players are P1, P2, P3, and P4.)

20. The weight of the coalition {P2, P3} is
   A) 5  B) 32  C) 6  D) 19  E) None of the above

21. Which players are critical in the coalition {P1, P2, P4}?
   A) None  B) P1 only  C) All three of the players  D) P1 and P2 only  E) None of these

22. In this weighted voting system, which players have veto power?
   A) P1 only  B) P1, P2, and P3 only  C) P1 and P2 only  D) All of the players  E) None of the players

23. The Banzhaf power distribution of the weighted voting system is
   A) P1 = 1/4; P2 = 1/8; P3 = 1/4; P4 = 1/8
   B) P1 = 5/12; P2 = 1/12; P3 = 1/12; P4 = 1/12
   C) P1 = 4/12; P2 = 3/12; P3 = 3/12; P4 = 2/12
   D) P1 = 1/2; P2 = 1/2; P3 = 1/2; P4 = 1/2
   E) None of these

Questions 24 to 26 refer to the Shapley Shubik definition of power and the following weighted voting system [10: 7, 5, 3]

24. Which player in the sequential coalition <P1, P2, P3> is pivotal?
   A) P1  B) P2  C) P3  D) all three  E) none of these

25. Which player in the sequential coalition <P3, P2, P1> is pivotal?
   A) P1  B) P2  C) P3  D) all three  E) none of these

26. Find the Shapely Shubik power distribution of the weighted voting system.
   A) P1 = P2 = P3 = 33.3%  B) P1 = 50%, P2 = 33.3%, P3 = 66.7%
   C) P1 = P2 = 50%, P3 = 0%  D) P1 = 66.7%, P2 = P3 = 16.7%  E) None of these
27. Find the Shapley Shubik distribution of power of the following weighted voting system [27:12, 9, 6, 3]

A) $P_1 = P_2 = P_3 = 33.3\%, P_4 = 0$
B) $P_1 = 41.6\%, P_2 = 33.3\%, P_3 = 20.8\%, P_4 = 4.2\%$
C) $P_1 = 66.7\%, P_2 = P_3 = 16.7\%, P_4 = 0\%$
D) $P_1 = P_2 = P_3 = P_4 = 25\%$
E) None of these

$P_1 = \frac{8}{24} \quad P_2 = \frac{8}{24} \quad P_3 = \frac{8}{24} \quad P_4 = \frac{9}{24}$