Ch 9 CODED INEQUALITIES

ANSWERS AND EXPLANATIONS

1. (c) M = K ..... (i);

    D $\leq$ K ..... (ii);

    R < K ..... (iii)

    From (i) and (ii), we get

    M = K $\geq$ D $\Rightarrow$ M $\geq$ D

    Hence, either M > D (conclusion II) or M = D (conclusion I) is true

2. (d) F $\leq$ M... (i); M > R... (ii); E $\geq$ F... (iii)

    From (i) and (iii), no specific relation can be obtained between M and E. Similarly, no specific relation can be obtained between R and E.

3. (e) H = K... (i); T < H...(ii),

    W $\leq$ T ...(iii)

    From (i), (ii) and (iii), we get

    K = H > T $\geq$ W $\Rightarrow$ K > W (conclusion I) and

    T < K (conclusion II).

4. (b) N > A... (i), A < L... (ii), F = N...(iii)

    From (i) and (iii), we get

    F = N > A $\Rightarrow$ F > A (conclusion II). But no specific relation can be obtained between L and F. Hence, conclusion I is not necessarily true.

5. (b) B $\leq$ D...(i); D = M...(ii);

    F > M ...(iii)

    From (i), (ii) and (iii), we get

    F > M = D $\geq$ B $\Rightarrow$ B $\leq$ M and F > B (conclusion II).

    Since, B $\leq$ M, therefore, conclusion I is not necessarily true.

6. (e) P $\neq$ Q ...(i), Q > R ... (ii), P = R ...(iii)

    From (ii) and (iii), we get Q > R = P $\Rightarrow$ Q > P. Hence, both I and II are true.

7. (a) $A = B$ ... (i), $B \neq C$ ... (ii), $C < A$ ... (iii) From (iii), conclusion I is true. II contradicts statement (ii), hence, it is not true.

8. (d) $Y \geq Z$ ...(i), $Z > Q$ ... (ii), $Q \neq P$ ...(iii)

    From (i) and (ii), we get $Y > Z > Q \Rightarrow Y > Q$ ... (A)

    Hence, I is not true. From (iii), two possible relationships between P and Q are;

    Case I: When $P > Q$

    Now, using (A), we get $Y > Q < P \Rightarrow$ no conclusion.

    Case II: When $Q > P$

    using (A), we get $Y > Q > P \Rightarrow Y > P$. Hence, II is not true.

9. (b) $E > F$ .... (i), $F > L$ ... (ii), $L = N$ ...(iii)

    From (ii) and (iii), we get $F \geq L = N \Rightarrow F \geq N$ or $N \leq F$.

    Hence, I may be true but not necessarily so.

    From (i) and (ii), we get $E > F \geq L \Rightarrow E > L$

    Hence, II is true.

10. (d) $H \geq J$ ... (i), $J < K$ ... (ii), $K > M$ ... (iii)

    From (ii) and (iii), we get $J < K > M \Rightarrow$ no relationship between J and M can be established. Hence, II can't be established. Again, combining all we can't conclude the relationship between H and M. Hence, I is not true.

11. (c) $M \geq T$ ... (i), $T = V$ .... (ii), $V < E$ ...(iii)

    From (i) and (ii), we get

    $M \geq T = V \Rightarrow M \geq V \Rightarrow$ either $V = M$ or $V < M$ is true.

12. (d) L < U ...(i); U > G ...(ii); G > S ...(III)

    Combining (ii) and (iii), we get

    U > G $\geq$ S ...(IV)

    Now, from (i) and (iv), we do not get any specific relation between L and S. Hence, conclusion I (L > S) is not true. On a similar basis conclusion II

(G < L) is also not true.

13. (e) A $\leq$ U ...(i) U = L ...(ii), J   > L ...(iii)

Combining (i) , (ii) and (iii), we get

$$J > U = L \geq A \Rightarrow J > A \text{ and } J > U.$$

Hence, both the conclusions are true.

14. (a) C $\leq$ S ...(i) S < D ...(ii); D > M ...(iii)

Combining (i) and (ii), we get

D > S $\geq$ C ...(iv)

From (iv), we get D > C. Hence, conclusion I is true. From (iii) and (iv), we do not get any specific relation between S and M. Hence, conclusion II is not true.

15. (c) Y < G ...(i); G $\geq$ H ...(ii); H = R ...(iii)

Combining (ii) and (iii), we get

G $\geq$ H = R $\Rightarrow$ R = G or R < G

Hence, either conclusion I or conclusion II is true.

16. (b) P $\geq$ Q ...(i), D > P ...(ii); S = D ...(iii)

Combining (ii) and (iii). we get

S = D > P $\Rightarrow$ S > P. Hence, conclusion II is true. But I is not true.

17. (b) Z < N ....(i); F $\geq$ N .... (ii); F $\leq$ K ....(iii)
Combining all, we get

K $\geq$ F $\geq$ N > Z $\Rightarrow$ K $\geq$ N and K > Z

Hence, conclusion I (K = N) is not necessarily true but conclusion II (K > Z) is true.

18. (c) D = T ....(i); T $\geq$ M ....(ii); M < K ... (iii)
Combining (i) and (ii), we get

D = T $\geq$ M $\Rightarrow$ D $\geq$ M $\Rightarrow$ D = M or D > M

Hence, either conclusion I (M = D) or conclusion I (D > M) is true.

19. (c) W $\geq$ A ...(i); B $\leq$ A .... (ii); B > M ... (iii)
Combining all, we get

W $\geq$ A $\geq$ B > M $\Rightarrow$ B $\leq$ W

$\Rightarrow$ B < W or B = W

Hence, either conclusion I or II is true.

20. (a) J $\leq$ M ....(i); M = N ...(ii); N < T .... (iii)
Combining all, we get

J $\leq$ M = N < T $\Rightarrow$ T > J

Hence, only conclusion I is true

21. (d) V $\leq$ F .... (i); F > R .... (ii); R $\geq$ G ....(iii)

Combining (ii) and (iii), we get F > R $\geq$ G ....(iv)
Comparing (i) and (iv), we can't get any specific relationship between G and V. Hence, both conclusions are not true.

22. (d) $B = K$ ...(i);

$K < D$ ...(ii);

$D > M$ ...(iii)

From (i) and (ii), we get

$D > K = B$ ...(iv)

From (iii) and (iv), no specific relation can be obtained between B and M. Therefore, $B = M$ (Conclusion I) and $B < M$ (Conclusion II) are not necessarily true.

23. (b) $H < N$ ... (i)

$N > W$ ...(ii);

$W \geq V$ ...(iii)

From (ii) and (iii), we get

$N > W \geq V$ ...(iv)

From (i) and (iv), no specific relation can be obtained between H and V. Hence, $H < V$ (Conclusion I) is not necessarily true. But $V < N$ (Conclusion II) follows from equation (iv).

24. (c) $J \leq D$ ...(i);

$Q \geq D$ ...(ii);

$Q < M$ ...(iii)

Combining (i) and (ii), we get

$Q \geq D \geq J \Rightarrow Q > J$ (Conclusion I) or $Q = J$

(Conclusion II)

Hence, either conclusion I or conclusion II is true.

25. (b) $F \geq G$ ...(i);

$N = G$ ... (ii);

$N > T$ ... (iii)

Combining all, we get

$F \geq G = N > T \Rightarrow N \leq F$ (Conclusion II) and $T < F$

Hence, conclusion I ($T > F$) is not true but conclusion II is true.

26. (a) $M > R$ ...(i);

$R < K$ ...(ii);

$K = T$ ... (iii)

Combining (ii) and (iii), we get

$K = T > R$

$\Rightarrow T > R$ (Conclusion I).

On the basis of the given information no specific relation can be obtained between T and M. Hence, $T > M$ (Conclusion II) is not necessarily true.

27. (d) $K \geq M$ ... (i); $M \neq R$ ...(ii); $R = T$ ...(iii)

Combining all equations, we get

$K \geq M \neq R = T \Rightarrow M \neq T$

From this we can't get any specific relation between K and T. Hence, conclusion I is not true. Conclusion II is false since $M \neq T$.

28. (b) $B < D$ ....(i); $D > N$ ...(ii); $N \leq H$ ...(iii)

From equations (ii) and (iii), we can't obtain any specific relation between H and D. Hence, conclusion I ($H \geq D$) is not true. But conclusion II ($H \geq N$) follows from equation (iii)

29. (d) $M \geq K$ ... (i); $K > P$ ...(ii); $P \leq N$ ...(iii)

Combining (i) and (ii), we get

$M \geq K > P$ ...(iv)

From (iii) and (iv), no specific relation can be obtained between M and N. Hence, conclusion I ($M > N$) and conclusion II ($M = N$) are not true.

30. (c) $T \leq M$ ...(i); $M = Q$ ...(ii); $Q < R$ ...(iii)

Combining (i) and (ii) we get

$M = Q \geq T \Rightarrow Q > T$ (Conclusion I) or $Q = T$ (Conclusion II)

31. (e) $D > B$ ... (i); $B \leq T$ ...(ii); $T < M$ ...(iii)

Combining (ii) and (iii), we get

$M > T \geq B \Rightarrow M > B$ (Conclusion I) and $T \geq B$ (Conclusion II).

32. (e)

33. (b) $K > B$ ...(i), $B \leq D$...(ii), $D < K$...(iii)

From (i), $B < K$. Hence II is true but I is not true.

34. (c) $N = R$...(i), $R \leq M$...(ii), $M \geq J$...(iii)

From (i) and (ii), we get $N = R \leq M \Rightarrow N \leq M$. Hence either I or II is true.

35. (a) $S \geq T$...(i), $T \leq R$... (ii), $R < M$ ... (iii)

From (ii) and (iii), we get $T \leq R < M \Rightarrow T < M$ or $M > T$. Hence I is true and II is not true.

36. (d) $H \leq V$ ... (i), $V = M$ ... (ii), $M > R$... (iii)

Combining all, we get $H \leq V = M > R \Rightarrow$ no relationship between H and R can be established. Since conclusions I and II are not exhaustive, neither of them is true.

37. (c) $S \geq K$... (i); $T < K$ ... (ii);

$K \geq B$ ... (iii)

Combining (i) and (iii), we get

$S \geq K \geq B$. Hence, $S > B$ or $S = B$. Therefore either conclusion I or II is true.

38. (e) Combining all the three statements, we get

$Y = Z \geq D = H$. Therefore $D \leq Y$ and $H \leq Z$ are true.

39. (b) Combining all the three statements together we get

$M > N > P > R$. Therefore $P \leq M$ is not true, but $R < N$ is true.

40. (d) Combining I and III, we get

$S \geq K > T$. Therefore $S \leq T$ is not true. We have no information about the relationship between B and T.

41. (e) Combining all the three statements, we get

$M > N > P > R$. Therefore $N > R$ and $P < M$ are true.

42. (a) $J > T$ ....(i)

$T \leq B$....(ii)

$B < R$ ... (iii)

From (ii) and (iii), we get

$R > B \geq T$ ... (iv)

Hence, no specific relation can be obtained between (i) J and R or (ii) J and B. Hence, neither I nor III follows. From equation (iv) we get $R > T$. Therefore, conclusion II does not follow.

43. (b) $T \leq M$ ... (i)

$K < M$ ...(ii)

$K \geq Z$ ... (iii)

From (ii) and (iii), we get

$M > K \geq Z$ ...(iv).

$\Rightarrow M > Z$

Hence, conclusion II (Z < M) follows. But conclusion III (M = Z) does not follow. Again, no specific relation can be obtained between T and Z. Hence, conclusion I does not follow.

44. (e) $K \leq N$ ...(i);

$N = T$ ...(ii);

$R < T$ ...(iii)

From (i) and (ii), we get

$T = N \geq K$ ...(iv)

From (ii) and (iii), we get

$T = N > R$ ...(v)

From equation (iv), we get $T \geq K$. Hence, conclusion II (T > K) is not necessarily true.

From equations (iv) and (v) we can't obtain any specific relation between K and R. There fore, conclusion I and conclusion III do not follow. Thus, no conclusion follows.

45. (d) $H > M$ ... (i); $M \geq D$ ... (ii); $T < D$ ... (iii)

From (i), (ii) and (iii), we get

$H > M \geq D > T$ ...(iv)

From equation (iv), we get H > T. This implies T < M. Hence, conclusion I follows.

Again, H > D. Hence II follows but III does not.

46. (e) $W \geq M$... (i); $M > F$... (ii); $D \leq F$...(iii)

From (i), (ii) and (iii), we get

$W \geq M > F \geq D$...(iv)

From (iv); we get W > D. Hence, conclusion I (D < W) follows. Again, from the equation (iv), we get M > D. Hence, conclusion II (M > D) follows. Again, from the equation (iv), we get W > F. Hence, conclusion III (F < W) follows.

47. (d) $M < K$ ... (i); $K = D$... (ii); $D < P$...(iii)

Combining all the equations, we get

$P \geq D = K > M \Rightarrow P > M$. Hence, conclusion I (M ≤ P) and conclusion II (M = P) are not true.

48. (e) $W \geq T$... (i); $T > M$... (ii); $B < M$ ...(iii)

Combining all, we get $W \geq T > M > B$

$\Rightarrow W > B$ and W > M. Hence, both conclusions (W > B, M < W) are true.

49. (d) $H = D$ ...(i); $D < R$ ...(ii) $R \geq N$ ...(iii)

Combining (i) and (ii), we get

$R > H = D$ ...(iv)

From (iii) and (iv), we cann't get any specific relation between N and H. Therefore, conclusion I (N = H) and conclusion II (N > H) are not true.

50. (d) $Z \leq R$ ...(i); $R \geq D$ ...(ii); $D < T$ ...(iii)

With these equations no relation can be established between D and Z, and Z and T.

51. (c) $Q < P$ ...(i), $P \leq F$ ...(ii); $F = M$ ...(iii)

Combining all the equations, we get

$F = M \geq P > Q \Rightarrow M \geq P$, ie M > P or M = P

Hence, either conclusion I or II is true.

52. (d) $E > J$ ...(i); $J < H$ ...(ii); $H \geq M$... (iii)

No relation can be established between E and M or between J and M. Hence, conclusion I (E > M) and conclusion II (J > M) are not true.

53. (b) $R \geq P$ ...(i); $P > M$ ...(ii); $M \leq D$ ...(iii)

Combining (i) and (ii), we get $R \geq P > M$ ...(iv).

From conclusion (iv), we get R > M. Hence, conclusion II (M < R) is true. But we can't get any specific relation between D and R. Therefore conclusion I is not true.

54. (c) $F < K$ ...(i); $K \geq D$ ...(ii); $N \leq D$ ...(iii)

Combining the equations (ii) and (iii), we get

$K \geq D \geq N \Rightarrow K \geq N$, i.e., K > N or K= N

Hence, either conclusion I or conclusion II is true.

55. (a) $Z = D$ ... (i); $F \leq D$ ...(ii) $F > H$ ...(iii)

From (i), (ii) and (iii), we get

$Z = D \geq F > H \Rightarrow H < Z$ (conclusion I)

and $Z \geq F$

Hence, conclusion I is true but conclusion II does not necessarily true.

56. (a) M < N ... (i); N ≤ T ...(ii); T > B ...(iii)

From (i) and (ii), we get

$T \geq N > M \Rightarrow T > M$ (conclusion I)

But no relation can be obtained between B and N. Hence, conclusion II does not follow.

57. (d) $T \geq R$ ....(i); K > R ...(ii); M < K ...(iii) From (ii) and (iii), we can't compare R and M. Hence, I does not follow. On a similar basis, we can't compare M and T. Hence, conclusion II also does not follow.

58. (b) $M \leq K$ ...(i) B < K ...(ii) B > J ... (iii) Combining (ii) and (iii), we get

K > B > J ....(iv)

From (i) and (iv) we can't obtain any relation between M and J. Hence, conclusion I does not follow. But conclusion II is true from (iv).

59. (c) $V \geq R$ .... (i); T = V ...(ii);

$T \leq E$ .... (iii)

From (i), (ii) and (iii), we get

$E \geq T = V \geq R \Rightarrow E \geq R \Rightarrow E > R$ or $E = R$