

Q2) Bayesian Networks.

$$i) = A \perp\!\!\!\perp C \mid B, D.$$

This is True because, when conditioned on B and D all paths b/w A and C are blocked. Arrows meet head to tail at node B and D.

$$\therefore \underline{A \perp\!\!\!\perp C \mid B, D \text{ holds True}}$$



$$ii) = B \perp\!\!\!\perp D \mid A, C$$

This is False, when conditioned on ~~B and D~~ A and C there is still an active path b/w B and D.

Mathematically

$$\frac{P(A, B, C, D)}{P(A, C)} = \frac{P(A) P(B \mid A) P(D \mid A) P(C \mid B, D)}{P(A) \times P(C \mid B, D)}$$

$$= P(B \mid A) P(D \mid A)$$

$$\neq B \perp\!\!\!\perp D \mid A, C$$

$$\therefore \text{This is } \underline{\text{False}}$$

