



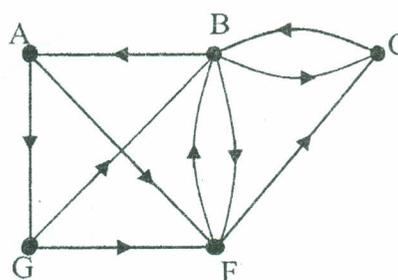
DURATION: - ONE AND HALF HOURS

Date: - 12 – 11 – 2016

Time: - 04.00 p.m. – 05.30 pm

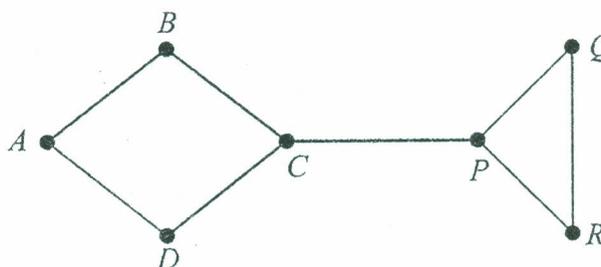
ANSWER ALL QUESTIONS. THE TOTAL MAXIMUM MARK ATTAINABLE IS 200 AND THE FINAL MARK WILL BE CONVERTED TO 100%.

01. Let $X, Y \in V$ and let $d(X, Y)$ be the minimum length among all $X - Y$ walks in the following digraph $D = (V, E)$.



- (i) Show that D is strongly connected, [30 Marks]
- (ii) Is D a tournament? Justify your answer, [10 Marks]
- (iii) Verify the *Handshaking dilemma*, [10 Marks]
- (iv) Is $\sum_{i=1}^n \text{in deg}(X_i)^2 = \sum_{i=1}^n \text{out deg}(X_i)^2$? Justify your answer. [10 Marks]

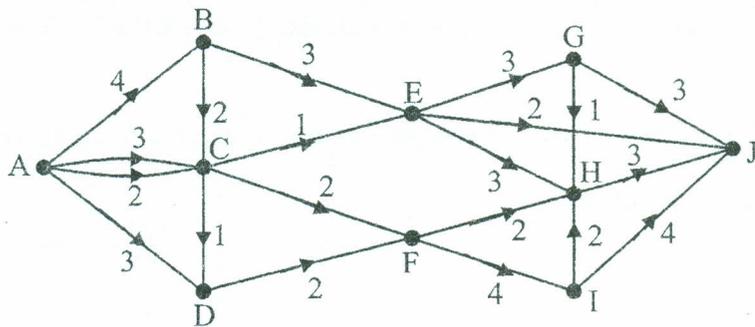
02. (a) Let G be the following graph.



- (i) Write down two cut points in G , [10 Marks]
- (ii) Are there any bridges in G ? Justify your answer, [10 Marks]
- (iii) Draw three blocks of G . [15 Marks]

- (b) (i) Draw the total graph $T(K_3)$ of K_3 , [10 Marks]
(ii) Draw the line graph $L(K_4)$ of K_4 , [10 Marks]
(iii) Show that $T(K_3)$ and $L(K_4)$ are isomorphic. [20 Marks]

03. Let N be the following network.



- (i) List two AJ -disconnecting sets from the above network N , [10 Marks]
(ii) List four edge-disjoint paths in the network N , [20 Marks]
(iii) Draw a possible flow for the network N , [25 Marks]
(iv) Is $\text{maximum flow} = \text{minimum cut}$ in the network N ? Justify your answer. [10 Marks]