The Open University of Sri Lanka Department of Mathematics and Computer Science B.Sc/ B.Ed Degree Programme Open Book Test (OBT) - 2015/2016 Applied Mathematics- Level 05 APU3244/ APE5244- Graph Theory



DURATION: - ONE AND HALF HOURS

Date: - 02 - 10 - 2016

Time: - 10.30 a.m. - 12.00 noon

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

01. (a) Find a *minimal edge coloring* of each of the following graphs:

(i) K_4 (ii) $K_{2,3}$ (iii) W_5 [3×10 Marks]

(b) Consider the following map:



 (i) Find the minimum number of colors needs to color the regions of the map so that whenever 2 regions are separated by a boundary takes different color,

[15 Marks]

 (ii) Draw the planar graph corresponding to this map, and find the minimum number of colors needs to color the vertices of the graph so that adjacent vertices have different colors.

- (i) (ii) $(3 \times 10 \text{ Marks})$
- 02. (a) State whether each of the following graphs is *Eulerian* or *non-Eulerian*: Give reasons for your answers.

(b) A municipal council is responsible for maintaining the roads in a city in the following figure. The number on each edge is the length of the road in kilometers. The council office is located at A.



- (i) A supervisor, based at A, wishes to inspect all the roads. However, the supervisor lives at G and wishes to start his route at A and finish at G. Determine the minimum distance that the supervisor has to travel, [15 Marks]
- (ii) Use *Dijkstra's algorithm* to find the minimum distance from A to G, [25 Marks]
 - Hence, find the minimum distance that a council worker who also has to monitor all these roads, starting and finishing at A. [10 Marks]

03. (a) Use *Kruskal's Greedy algorithm* to find the minimum weighted spanning tree for the following weighted graph and determine its minimum weight:



[20 Marks]

(b) Use the Kuratowski's theorem to show that the following graphs are non-planar.





[2×20 Marks]