The Open University of Sri Lanka
Department of Mathematics
B.Sc/ B.Ed Degree Programme
No Book Test (NBT) - 2016/2017
Applied Mathematics– Level 05
APU3244 – Graph Theory

DURATION: - ONE AND HALF HOURS

Date: - 05 – 11– 2017 Time: - 04.00 p.m. – 05.30 p.m.

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

01. In each of the following cases, draw a graph which satisfies those conditions:

(a) A *non-Eulerian* graph that is *orientable*, [10 Marks]

(b) A *non-Hamiltonian tournament* that is *semi-Hamiltonian*, [15 Marks]

(c) A *strongly connected tournament* that is *Hamiltonian*, [15 Marks]

(d) A *connected* graph that is isomorphic to its *line graph*, [10 Marks]

(e) A graph which is both *Eulerian* and *Hamiltonian* so that its *line graph* is also both *Eulerian* and *Hamiltonian*. [10 Marks]

02. Let $E=\{1,2,3,4,5,6\}$ and let $S_1=\{2,3\}$, $S_2=\{2,3\}$, $S_3=\{1,2\}$, $S_4=\{1,2\}$ and $S_5=\{1,4,5,6\}$.

(a) Determine whether $\Im=(S_1, \ldots, S_5)$ has transversal or not. Justify your answer, [15 Marks]

(b) List three *partial transversals* of $\Im'=(S_1, S_2, S_3, S_5)$, [15 Marks]

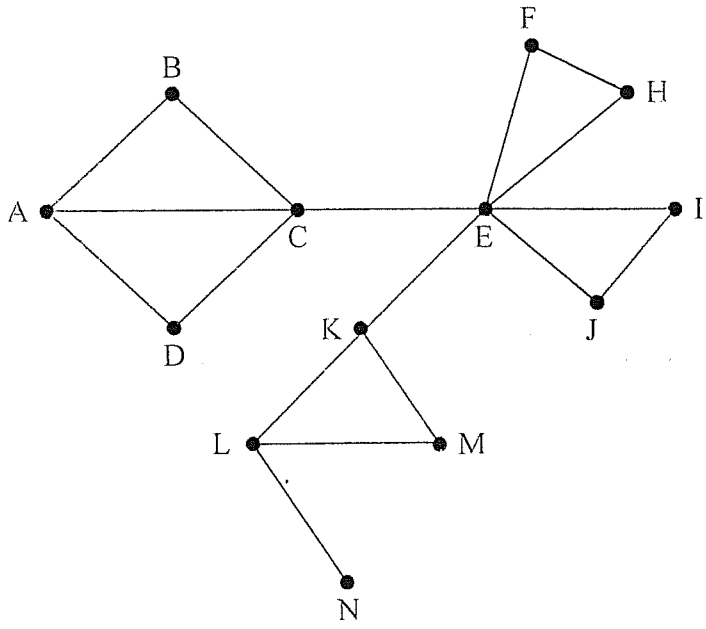
(c) Write down the *incidence matrix* A of the *family* $\Im$. [10 Marks]

Hence, find the *term rank*, [05 Marks]

(d) Verify the *Kong- Egervacy theorem* for the *incidence matrix* A. [15 Marks]

Hence, verify your result obtained in part (a). [15 Marks]

03. Let G be the following graph.



(a) Find all the *cut points* in G and draw the *cut point graph*, [20 Marks]

(b) How many *bridges* are in G ? Justify your answer, [20 Marks]

(c) Find all *blocks* of G and draw the *block graph*. [25 Marks]