Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
200 Level 2nd Semester Examination – Dec. / Jan. 2018/19
CST 213-2 Discrete Mathematics II

Uva Wellassa University

Instructions to candidates

Duration: Two (02) hours
Number of questions: Four (04) essay questions
Mark allocation: 100 mark
Use standard symbols without definition.
Scientific calculators are allowed.
Answer all questions.

1.

a. Show that $e^{3y}-1=e^{x^3+3y+3C}$ is the solution of $\frac{dy}{dx}+x^2=x^2e^{3y}$, where C is an arbitary constant.

(05 mark)

b. Consider the initial value problem.

$$(1-x^2)\frac{dy}{dx}+2xy=x(1-x^2)^{1/2}\quad,\quad y(0)=-1$$

i. Show that the **Integrating factor** for this problem is $\frac{1}{1-x^2}$. (03 mark)

ii. Find the solution for this initial value problem. (07 mark)

c. Let $f(x)=\frac{d^2y}{dx^2}+6\frac{dy}{dx}-7y$

i. Find the solution for $f(x)=0$. (05 mark)

ii. Hence, solve $f(x)=6-7x$. (05 mark)

iii. If $\frac{1}{f(D)}e^{ax}=\frac{1}{f(a)}e^{ax}$, Solve $f(x)=e^{-6x}$. (05 mark)

45

2.

a. Solve the following system of equations . (10 mark)

$$\frac{dx_1}{dt} = 6x_1 + 5x_2$$

$$\frac{dx_2}{dt} = x_1 + 2x_2$$

b.

i. Write the general form of a Quasi Linear First Order partial differential equation.

(03 mark)

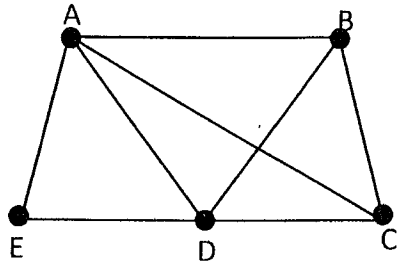
ii. Solve the following equation.

$$(3y - 2u)u_x + (u - 3x)u_y - (2x - y) = 0$$ (05 mark)

3.

a. Find the **adjacency matrix** and **incident matrix** of the following graph.

(05 mark)

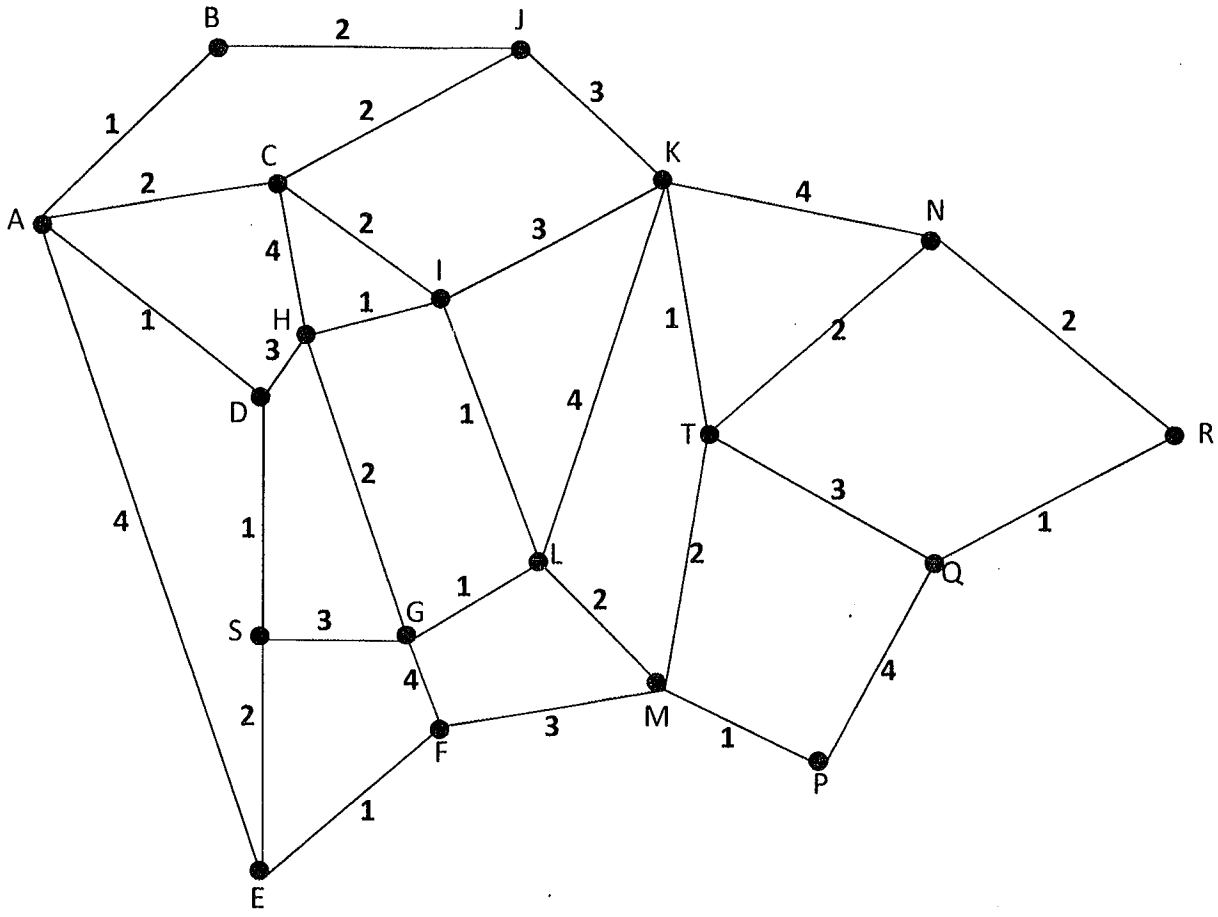


b. Draw the graph represented by the following adjacency matrix.

(04 mark)

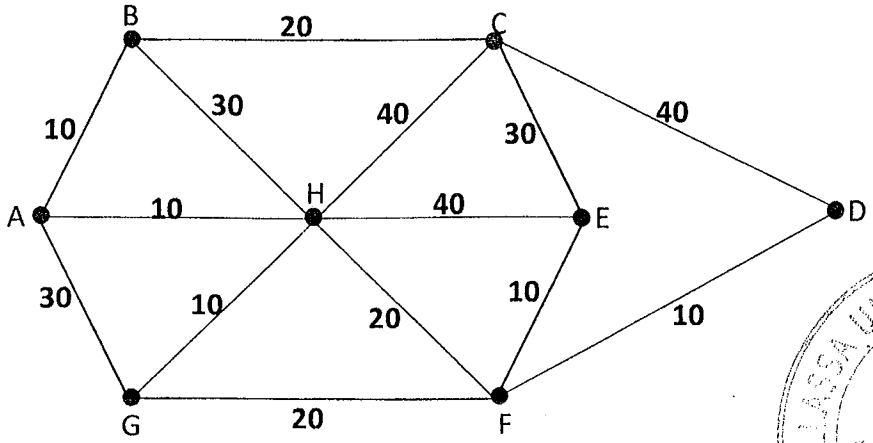
$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 2 \\ 0 & 1 & 0 & 1 \\ 1 & 2 & 1 & 0 \end{bmatrix}$$

c. Use **Dijkstra's algorithm** to find the shortest path from A to R , and its length in the graph given below. (08 mark)

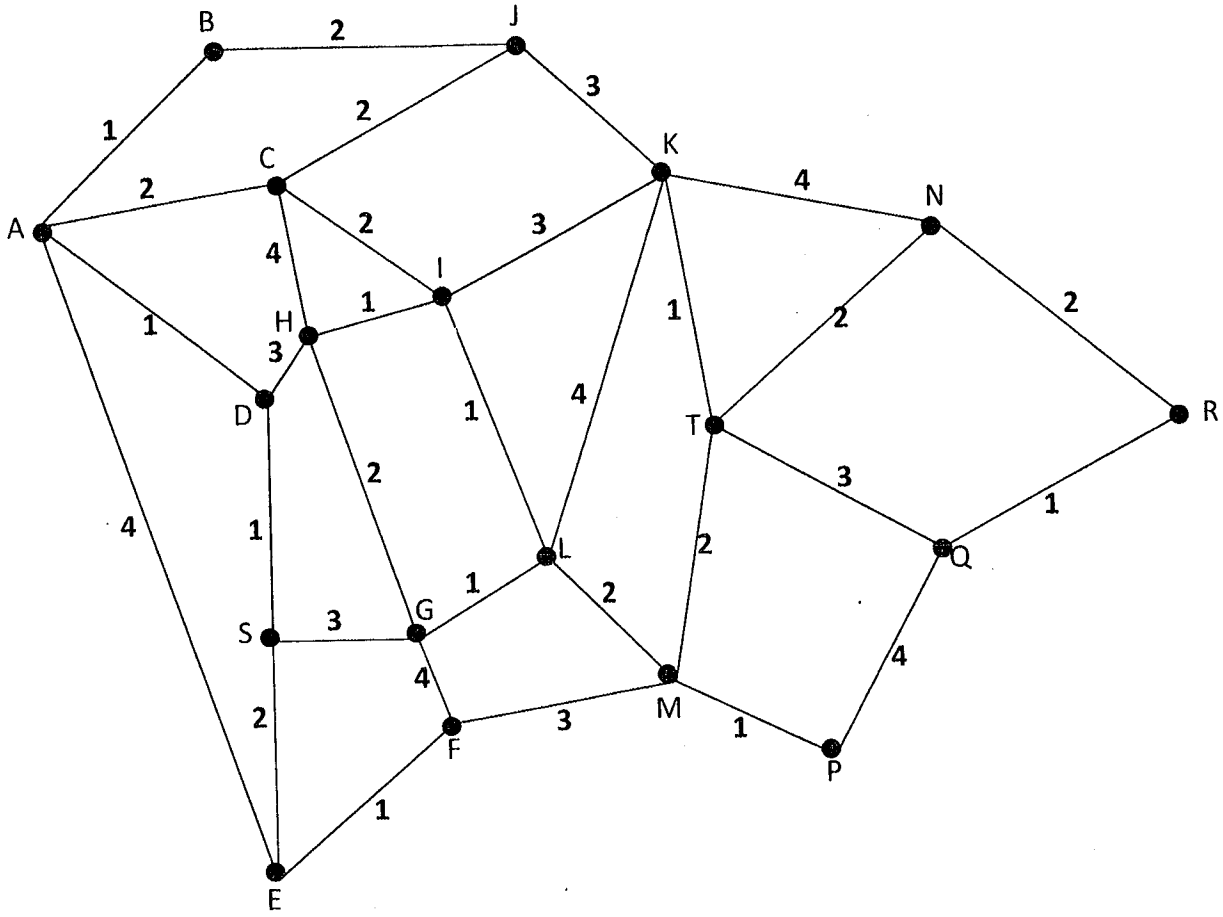


d. A postman wishes to deliver letters every day in a network of streets, covering the least possible total distance and return to the post office. He must travel each road in his route, at least once, but should avoid covering too many roads more than once. Find the minimum distance he has to travel.
(Where the non-negative numbers associated with edges represent the actual distances between corresponding nodes.)

(10 mark)

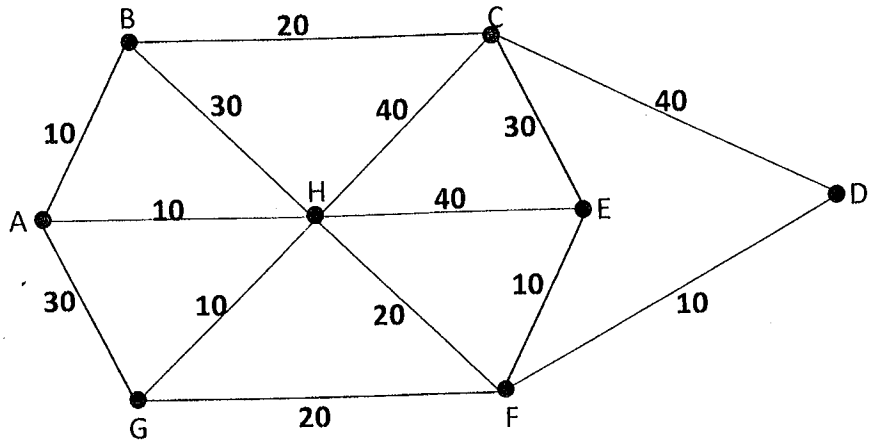


c. Use **Dijkstra's algorithm** to find the shortest path from A to R, and its length in the graph given below. (08 mark)



d. A postman wishes to deliver letters every day in a network of streets, covering the least possible total distance and return to the post office. He must travel each road in his route, at least once, but should avoid covering too many roads more than once. Find the minimum distance he has to travel.
(Where the non-negative numbers associated with edges represent the actual distances between corresponding nodes.)

(10 mark)



c. Suppose that in one particular semester, there are students taking each of the following combinations of courses.

- Mathematics, English, Biology, Chemistry
- Mathematics, English, Computer Science, Geography
- Biology, Psychology, Geography, Spanish
- Biology, Computer Science, History, French
- English, Psychology, History, Computer science
- Psychology, Chemistry, Computer Science, French
- Psychology, Geography, History, Spanish

What is the minimum number of examination periods required for exams in the ten courses specified so that students taking any of the given combinations of courses have no conflicts?

Find a possible shedule which uses this minimum number of periods.

(7 mark)