

Student Name: _____



GENERAL MATHEMATICS 2024

Unit 4

Key Topic Test 9 – Networks and Decision Mathematics: Scheduling Problems

Recommended writing time*: 45 minutes

Total number of marks available: 25 marks

QUESTION BOOK

* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

Conditions and restrictions

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers, approved CAS calculator and one bound reference book.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.

Materials supplied

- Question and answer book of 9 pages.

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

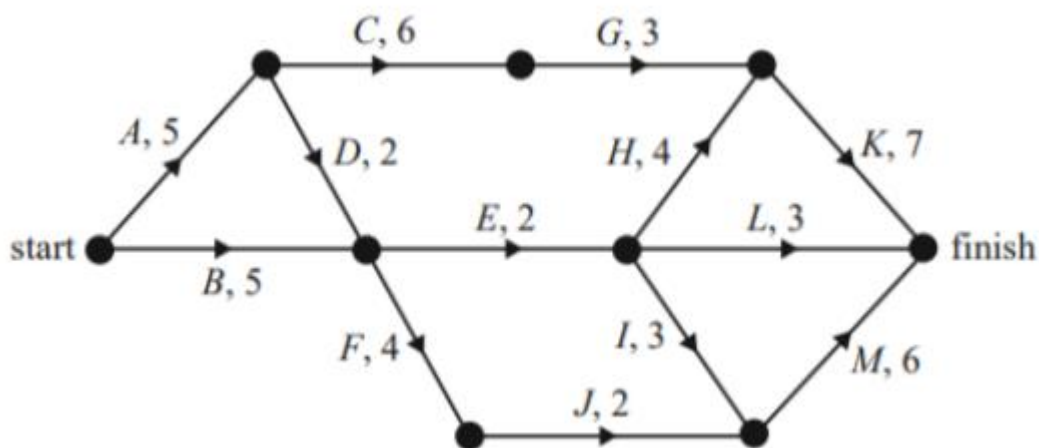
Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.

SECTION A – Multiple-choice questions**Instructions for Section A**

- All questions are worth one mark.
- Answer all questions by circling the correct response.
- Marks are not deducted for incorrect answers.
- No marks will be awarded if more than one answer is completed for any question

Use the following information to answer Questions 1 and 2

The following network shows the order of 13 activities for a project and their completion times (in hours).

**Question 1**

The earliest start time for activity K is:

- A. 13 B. 14 C. 15 D. 16 E. 17

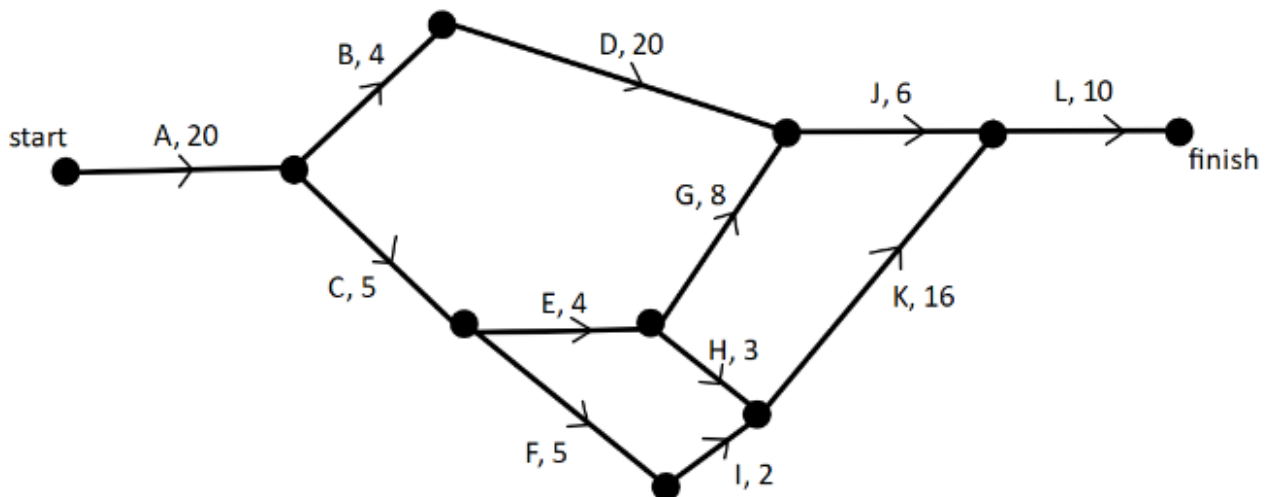
Question 2

The critical path for this project is:

- A. A – C – G – K
 B. A – D – F – J – M
 C. A – D – E – H – K
 D. B – E – L
 E. B – F – J – M

Use the following information to answer Questions 2, 3 and 4

The following network shows the overview of a project, with the duration of each activity shown in days:



Question 3

The latest start time for activity F is:

- A.** 25 **B.** 26 **C.** 27 **D.** 28 **E.** 29

Question 4

The critical path for this project is:

- A.** A – C – F – I – K – L
B. A – B – D – J – L
C. A – C – E – G – J – L
D. A – C – E – H – K – L
E. B – D – J – L

Question 5

The number of activities that can be delayed by at least one day, and not affect the completion time of the project is:

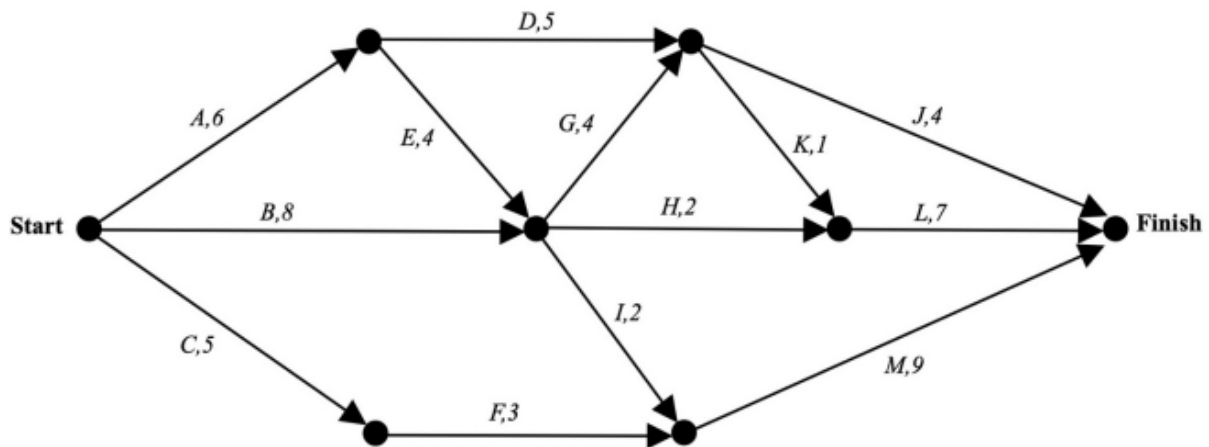
- A.** 4 **B.** 5 **C.** 6 **D.** 7 **E.** 8

SECTION B - Short-answer questions**Instructions for Section B**

- Answer each question in the space provided.
- Please provide appropriate workings and use exact answers unless otherwise specified.

Question 1 (7 marks)

A school group decides to purchase a transit van and turn it into a campervan. This project requires them to complete several tasks to get the van ready to go. There is a particular set of order restrictions for the activities, as seen in the network digraph below, along with the duration of each activity in days.



- a. State the immediate predecessor/s for activity I

1 mark

- b. Find the earliest start time for activity G

1 mark

- c. Find the float time for activity F

1 mark

- d.** State the critical path and minimum completion time for this project.

1 mark

The school group recruits 2 new members to their team. This means that they can now reduce the duration time of one activity only, by a maximum of 2 days.

- e.** Which activity/activities could be reduced that would result in the highest reduction of the minimum project time.

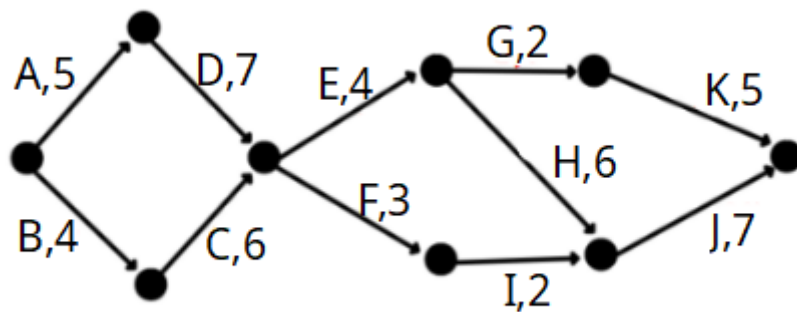
2 marks

- f.** Find the new minimum completion time of this project.

1 mark

Question 2 (5 marks)

The following network shows the order of activities A-K in a project, with the duration time in minutes.



- a. Find the shortest completion time for this project in minutes.

1 mark

- b. Highlight the critical path on the graph.

1 mark

- c. Find the activity/activities with the largest float time.

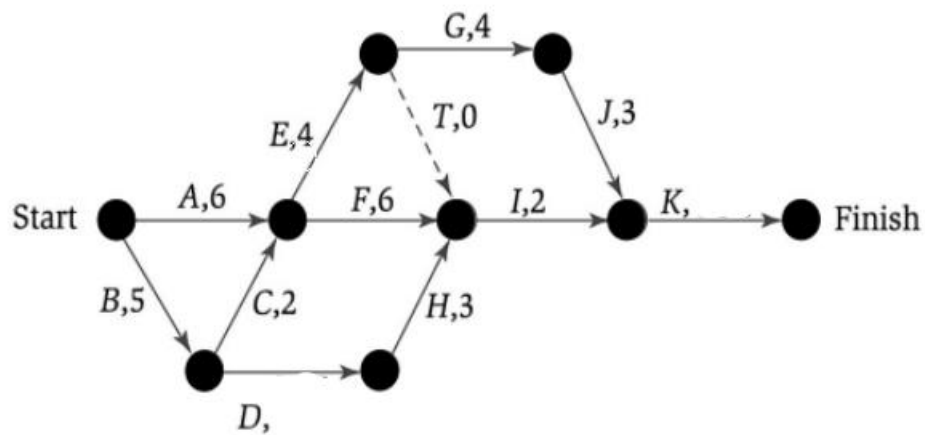
1 mark

- d. More resources are put into activity D such that its duration can be reduced. Find the maximum time that activity D can be reduced before reducing any further has no effect and what is the resulting completion time after this reduction.

2 marks

Question 3 (8 marks)

The activities and the durations (in hours) for a project are shown in the network diagram below. It is known that the least time required for completing the entire project is 32 hours.



- a. Explain the purpose of the activity T that has zero duration time.

1 mark

- b. Given activity I is not on the critical path. Find the duration of activity K.

1 mark

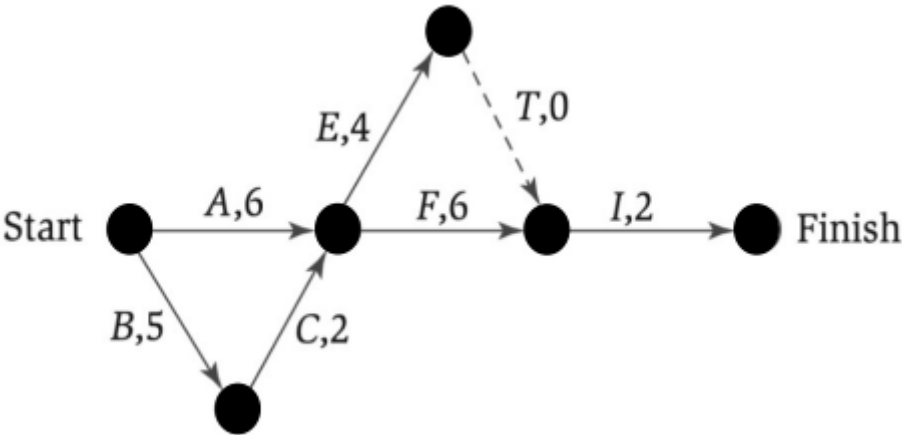
- c. If the float time for activity D is 4 hours, find the duration of activity D.

1 mark

- d. State the critical path for this project.

1 mark

To speed up the project, several activities have been eliminated. The new network diagram below shows the activities that are now required for the project.



e. Find the new completion time for the project.

1 mark

The remaining activities can be reduced, at a cost, according to the following table:

Activity	Maximum reduction time (hours)	Cost (\$ per hour) for reduction
A	3	60
B	1	90
C	0	-
E	2	25
F	2	60
I	0	-

f. Find the new minimum completion time for this project, and the minimum cost in order to achieve this.

3 marks

END OF KEY TOPIC TEST