GCE BUSINESS

A level

Unit 3

Critical path analysis

Starter activity

Operations recap: What is another term for the operations department?

From your previous studies state any technical terms may we include in answers for operations questions?

Activity	Proceeded by:	Time (seconds)
A: Switch on kettle and wait to boil	-	160
B: Find tea, sugar, milk and cup	-	30
C: Add tea, sugar, milk to cup	B	30
D: Add boiled water to cup	A,C	10

How long does it take to make a cup of tea? Explain your answer.

Task: It is the advertising break and you don't want to miss a second of your favourite show:

Objectives:

- Part A response: Content - Complete a network diagram (including filling in EST, LFT and critical path)
- Part B response: Apply and analyse quantitative and qualitative arguments for part B examination responses
- Evaluate the use of critical path analysis in forming a basis for business decision making.
- Calculate float (from the table)

Further reading: 584 – 590

Pre-reading

Critical Path Analysis (CPA) – What is it?

Network diagrams are used to help identify the relationship between events within the same project. In doing so, activities that can be carried out simultaneously can be identified.

Where will I see it in the exam?

Usual exam situations for CPA:

- A marketing campaign
- Opening a new store
- Entering a new market
- Launch of a new product

What is it used for in business?

The key to critical path is for managers to be able to identify which activities are dependent upon the completion of an earlier activity.

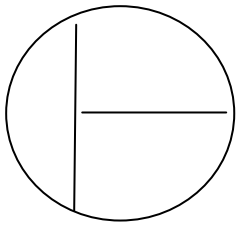
By outlining when activities take place it can be clear and which activities are critical to meeting a deadline managers know where to focus their efforts.

Earliest start time (EST)

This shows the earliest time at which the **following** can be started.

Why is it important to know the earliest start time?

- .
-

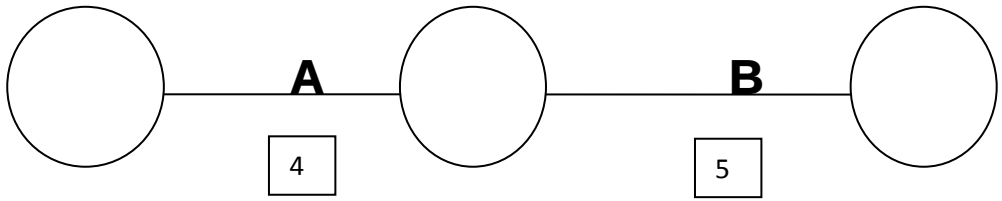


Latest finishing time (LFT)

LFT shows the time by which an activity must be completed. The LFT shows the latest finishing time of **preceding** activities. Calculating the LFT provides the **deadlines** which must be met in order for the project to be completed on time.

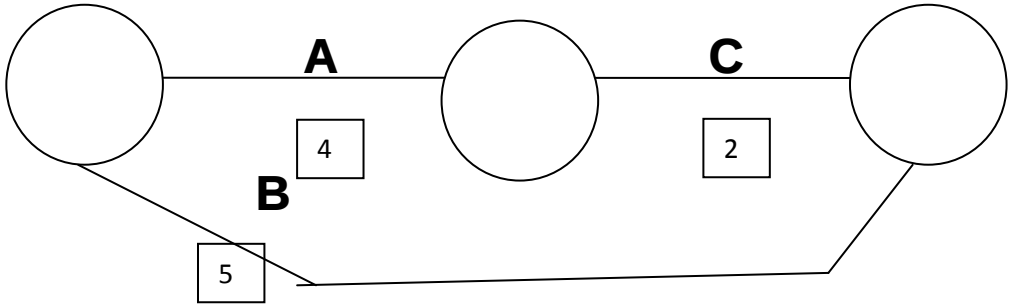
Activity

Activity	Proceeded by:	Time:
A	-	4
B	A	5



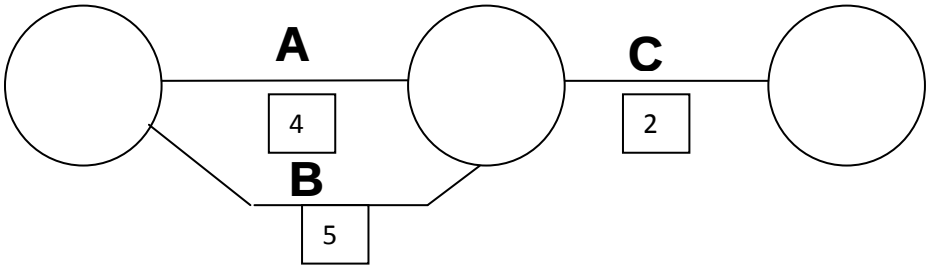
Construct the following.

Activity	Proceeded by:	Time:
A	-	4
B	-	5
C	A	2



Construct the following.

Activity	Proceeded by:	Time:
A	-	4
B	-	5
C	A, B	2



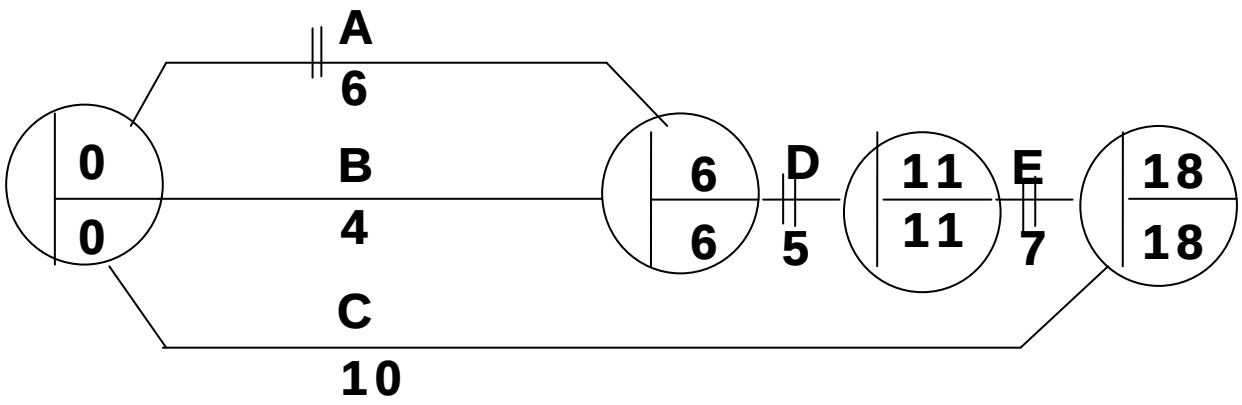
4

Draw a Network Below

a) **Construct a network diagram from the following information. (6)**

Activity	Preceded by	Duration (weeks)
A	-	6
B	-	4
C	-	10
D	A&B	5
E	D	7

b) **Calculate the earliest start time and latest finishing times and mark these in the nodes. (4)**



Identifying the critical path

The critical path comprises the activities which take the longest to complete. They determine the length of the whole project. These are the tasks that **cannot** be delayed or the whole project will be late.

To identify the critical path, the two key points are:

- It will be on nodes where the EST and the LFT are shown to be the same.
- It is the longest path (in terms of time) through **those** nodes.

When drawing a network, the critical path is identified by striking two short lines across the critical activities.

c) Identify the critical path from the previous question (1).

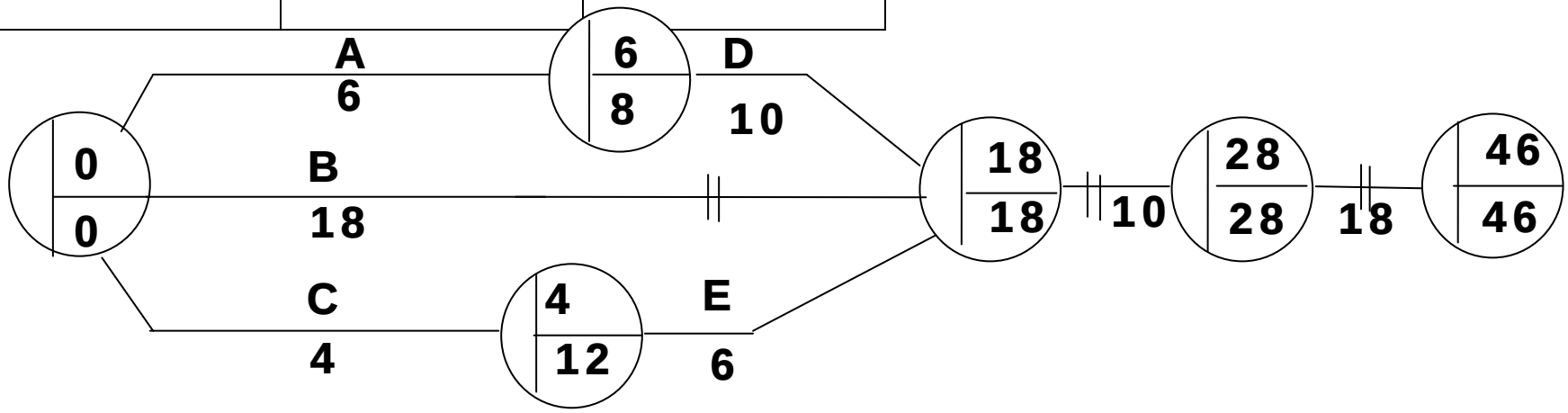
CP = A,D,E

Exam past paper question

2a) Use the following information to construct a fully labelled network showing EST's and LFT's and the critical path (6)

b) In the firm was offered a £2,000 bonus for completing the project in 40 weeks. How may this be achieved (8)

Activity	Preceded by	Duration (weeks)
A – plan TV advert	-	6
B – refine product	-	18
C - apply for patent	-	4
D – film TV advert	A	10
E – check legal standards	C	6
F – prepare final presentation for the board	B, D, E	10
G – patent search	C	18



Exam Question

Situation: Despite union problems in the last few weeks Ryanair aim to continue their expansion plans into the new market of long-haul flights. Richard Branson had already threatened to use his power in the aviation industry to block Michael O'Leary (Chief Executive of Ryanair) in his latest venture.

Construct a critical path network diagram for the 'long-haul project', using the information in the table below. Insert all earliest start times and latest finish times. Mark the critical path. *(10 marks)*

Activity	*Task*	*Preceded by:*	*Duration (weeks)*
A	*Recruit pilots*	*-*	*4*
B	*Arrange lease for aircraft*	*-*	*8*
C	*Negotiate leases for new operating bases*		*9*
D	*Prepare and plan promotion activity*	*-*	*12*
E	*Install fixtures in operating bases*	*C*	*6*
F	*Recruit and train ground crew at bases*	*C*	*7*
G	*Test flight paths in to new bases*	*A, B, E*	*2*
H	*Fully test operating systems*	*F, G*	*4*

b) Ryanair would like to begin construction of their new service within 20 weeks. To what extent is this likely to be feasible? (10)

Float time

Float time is the spare time available for the completion of any activity e.g. if an activity which must be completed in a week's time only takes three days there are four days float time. These can be used to complete the task in a more leisurely way and may allow you to allocated less resources to them which could be used elsewhere or the task can be started on day four.

There are two main types of float **total float** and **free float**. Total float is the spare time that is available so that there is no delay on the whole project. To work out the total float on any activity a formula can be applied:

LFT(this activity) – duration – EST (this activity) = **Total float**

Free float measures the spare time available so that there is no delay to the following activity. This is a tighter requirement, the formula is:

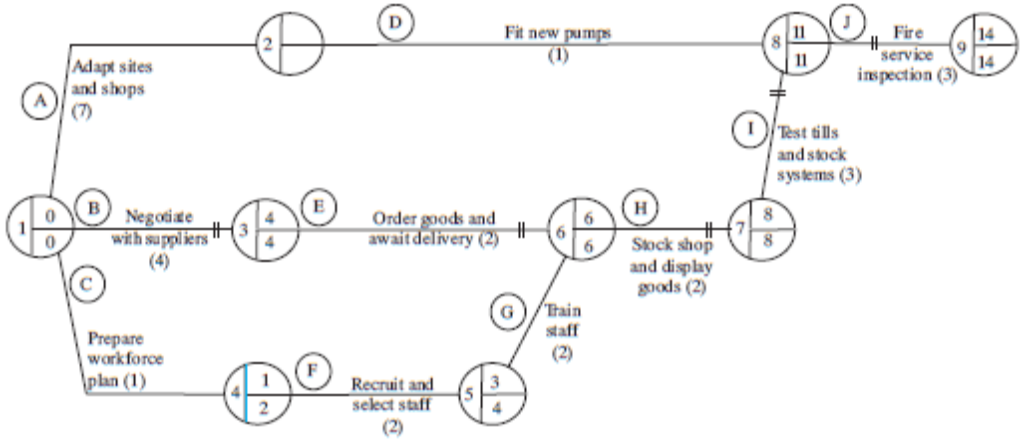
LFT – duration – EST = **Free float**

e.g.

Activity	LFT	Duration (weeks)	EST	Float
A	10	7	0	3
B*	4	4	0	0
C	2	1	0	1

***exam tip – there is no float on the critical path**

Exam question



3 (a) Refer to the network diagram in **Appendix B**.

(i) State the earliest start time and latest finish time at node 2. *(2 marks)*

(ii) Calculate the total float time on activities D and F. *(4 marks)*

(iii) Assume that there is a delay of two weeks in completing activity F. Analyse **one** action that the Operations Manager could take to avoid exceeding the current length of the critical path. *(4 marks)*

Advantages of CPA

- **Management consult all departments to find out all activities of a process**

- **Calculation of earliest time of completion benefits customer because there is an exact launch date**
- **It identifies the critical activities that must be finished on time to finish the work. Labour can be arranged accordingly.**

Disadvantages of CPA

- **It relies on estimate activity times. A more reliable method is Programme Evaluation and Review Technique (PERT).**
- **This estimate is based on optimism, pessimism and the most likely duration that a management team may specify.**
- **For Just In Time (JIT) delivery the JIT - need reliable suppliers**
- **The project needs to be managed correctly if it is to be completed on time**

3. A J Moore Ltd is a manufacturer of furniture. On page 4 there is a network diagram for the production of one of its wardrobes. Activities A to L need to be carried out in order to build one wardrobe, with the time allocation **being given in minutes**.

(a) Fill in the ***earliest start times*** and ***latest finishing times*** on the diagram overleaf. [5]

(b) Mark the critical path on the diagram on page 4. [1]

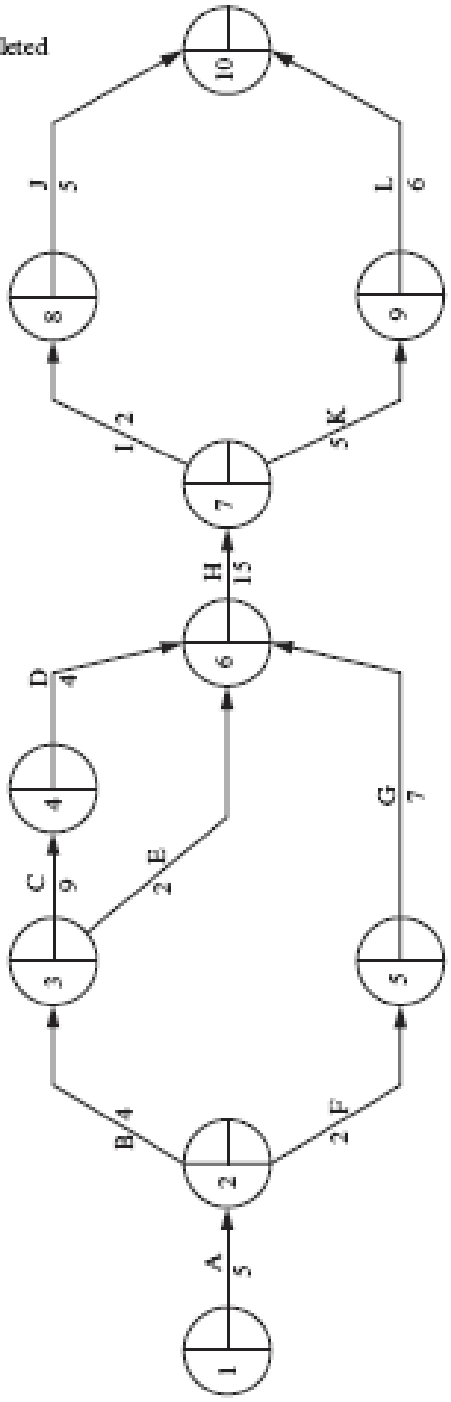
(c) Discuss the usefulness of critical path analysis to a company such as A J Moore Ltd. [8]

Centre Number .....

Candidate's Name (in full) .....

Candidate's Examination Number .....

Network diagram to be completed for Questions 3 *(a)* and 3 *(b)*.



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