



College of Engineering, Science and Technology (CEST)
School of Electrical & Electronic Engineering

ADVANCED DIPLOMA IN ENGINEERING AND BACHELOR OF ENGINEERING
(ELECTRICAL & ELECTRONICS) YEAR 2

EEE601 – ENGINEERING PLANNING

RESIT EXAMINATION - TRIMESTER 2

DAY/DATE: FRIDAY - 18TH AUGUST, 2017. TIME: 9.00am - 12:10pm.

INSTRUCTIONS TO STUDENTS:

1. You are allowed 10 minutes Extra reading time during which you are NOT to write.
2. Begin each Section on a fresh page and use both sides of the sheet.
3. Write your candidate – number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. ANSWER ALL QUESTIONS
8. THIS IS AN OPEN BOOK EXAMINATION AND YOU ARE ALLOWED TO BRING INTO THE EXAMINATION ROOM MATERIALS THAT ARE USEFUL TO THIS EXAM.
9. CANDIDATES ARE NOT ALLOWED TO EXCHANGE NOTES OR MATERIALS DURING THE COURSE OF THIS EXAMINATION.

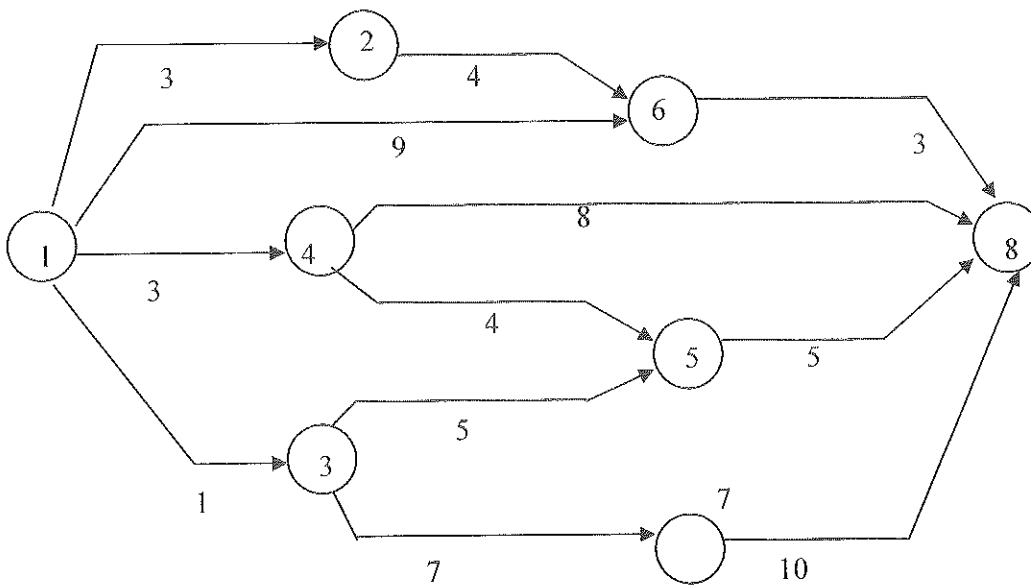
QUESTION 1 (40 marks total)

(i) A project has eight (8) activities identified by the code letters given on the table below. Table 1a below identifies the sequence in which the activities must be undertaken. Construct a network for the project. (10 marks)

Activity	Code Letter of Any Immediately Preceding Activity or Activities
A	--
B	--
C	B
D	A
E	A,B
F	A
G	C, E
H	C

Table 1a.

A CPM network for another different project is drawn below.. Activity times, in days, are indicated by the numbers that appears under each activity arrow.



(ii) Do analyse the network above and find the earliest and latest event times, and the minimum duration of the project.

(6 marks)

(iii) What amount of free float is associated with activity 2-6? (2 marks)

(iv) Draw a neat sketch of a sequenced bar chart, not a Gantt chart, for the above project with all activities shown at their earliest times.

(6 marks)

The number of people required for each activity involved in the project, is shown in the following table. The duration of individual activities cannot be altered by the allocation of additional people, nor may activities be divided into smaller components performed at different times.

Activity	People Required Per Day
1-2	6
1-3	4
1-4	7
1-6	3
2-6	2
3-5	1
3-7	1
4-5	5
4-8	6
5-8	4
6-8	3
7-8	2

(v) Indicate the number of people required for each day of the project with all activities at the earliest times

(2 marks)

(vi) By making use of the floats in the various activities, smooth the daily requirement for people as much as possible. What is the minimum ceiling of people required to complete the project in minimum time? Justify your answer by redrawing the bar chart and indicating the people required on each day.

(4 marks)

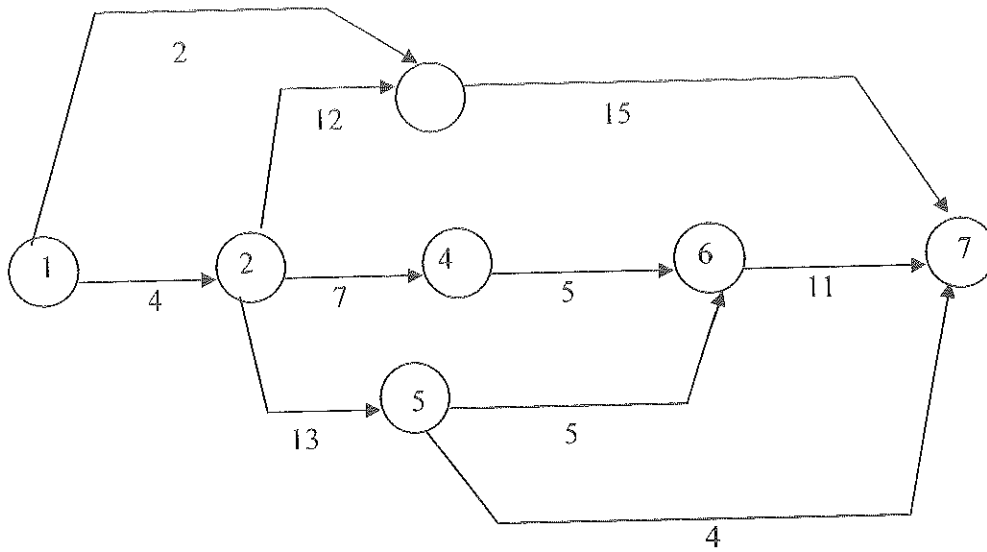
(vii) For the CPM network shown on the following page, the normal and crash durations for the activities in the project, and their associated costs are shown in the table underneath the network. Indicate what activity or activities should be crashed to reduce the project time by:

(a) 2 days

(b) 4 days

Estimate the increased costs that are in each case.

(10 marks)



Activity	Normal Duration		Crashed Duration	
	Days	Cost (\$)	Days	Cost (\$)
1-2	4	200	3	230
1-3	2	250	2	250
2-3	12	1200	10	1400
2-4	7	1200	6	1300
2-5	13	1500	10	1800
3-7	15	10	10	200
4-6	5	250	3	310
5-6	5	150	5	150
5-7	4	150	3	175
6-7	11	75	6	175

QUESTION 2 (20 marks total)

- (i) A company is able to produce a certain component by either a die casting process or a machining operation. Given the information in Table 2, which of these processes would be more economical for the manufacture of 6,000 such items? (Illustrate your answer by showing the total production costs for 6,000 items, for each process: the general overheads includes machine depreciation).

(12 marks)

	Die casting	Machining
Tool cost	\$10,000	\$1,000
Tool settlers' rate per hour	\$12.00	\$12.00
Set up time	6 hours	3 hours
General overheads per hour	\$10	\$8
Direct material cost per item	\$0.30	\$0.80
Operators' wage per hour	\$2.00	\$8.00
Time to produce one item	18 seconds	3 minutes

Table 2

- (ii) What is the minimum number of components that must be produced before the die casting process is more economical? (4 marks)

- (iii) If the selling price is \$1.80 per item, what is the profit made if 10,000 items were sold?

(4 marks)

QUESTION 3 **(20 marks)**

The managing director of the personnel management firm of Employee Research Pty Ltd designed a Critical Path Method program for their customers to use in the work finding process. She listed the activities which include such things as preparing resumes, writing letters, advertising, arranging interviews, interviewing, research into companies and industries, etc. The activities she considers may be necessary together with their probabilistic times (days) and their logical sequence are listed in the following table, Table 3.

Activity	Immediate Predecessor/s	days			Expected Time	Variance
		a	m	b		
A	-	8	10	12		
B	-	6	7	9		
C	-	3	3	4		
D	A	10	20	30		
E	C	6	7	8		
F	B, D, E	9	10	11		
G	B, D, E	6	7	10		
H	F	14	15	16		
I	F	10	11	13		
J	G, H	6	7	8		
K	I, J	4	7	8		
L	G, H	1	2	4		

Table 3

- (i) Do complete the table by inserting values for the expected time and the variance of each activity. (4 marks)

- (ii) Construct a CPM network for the activities listed using the expected completion time and clearly mark the critical path. (10 marks)

- (iii) Determine the probability that the project can be completed in the given days:
 - (a) seventy days
 - (b) eighty days
 - (c) ninety days (6 marks)

QUESTION 4 (20 marks total)

Dick Smythe Electronics is a new firm making small calculators. Dick Smythe entered the business with the production of an handheld calculator, the ZX-100, which sells for \$15. It has recently added a more powerful version of the ZX-100 called the ZX-200. The ZX-200 sells for \$25.

The variable costs of producing a ZX-100 and a ZX-200 are given in Table 4.

	ZX-100	ZX-200
Labour	\$3.00	\$5.00
Material	\$6.00	\$12.00
Production overhead	\$2.00	\$2.00
Total	\$11.00	\$19.00

Table 4

Dick Smythe produces its own circuit boards and purchases all other materials from other firms. Manufacturing of printed circuit boards is a complex operation, which requires precision equipment. Dick Smythe has the capacity to produce, at most, 61,000 basic printed circuit boards per month. One of these printed circuit boards is used in each ZX-100 calculator. To manufacture the advanced printed circuit board for the ZX-200 calculator takes three times as long on this precision equipment as the ZX-100. Therefore, if Dick Smythe made no printed basic circuits at all, it could produce no more than 20,333 (i.e. 61,000/3) of the ZX-200 boards. Dick Smythe can manufacture any combination of ZX-100 and ZX-200 printed circuit boards, as long as the combined production time does not exceed the available capacity.

Assembly time for the two calculators is:

- ❖ ZX-100: 0.2 hour
- ❖ ZX-200: 0.25 hour

If the company maintains its current two-shift operation, it has available 8000 hours of assembly time per month.

The marketing manager has undertaken a detailed study of the calculator market and foresees a monthly demand of 40,000 units for ZX-100 calculator and 18,000 units for ZX-200.

If Dick Smythe would like to maximise its profit, how many ZX-100 and ZX-200 calculators should it produce?

(You may use graphs to solve the problem and use the graph page available or otherwise)

The End