UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

INF3708

October/November 2014

SOFTWARE PROJECT MANAGEMENT

Duration : 2 Hours

50/80 x100

80 Marks

EXAMINERS :

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SECOND :	MR MC MALOMA
EXTERNAL :	PROF MO OHANGA

Use of a non-programmable pocket calculator is permissible.

Closed book examination.

This examination question paper remains the property of the University of South Africa and may not be removed from the examination venue.

INSTRUCTIONS

- **This paper consists of 6 pages.**
- Non-programmable calculators may be used.
- Show all calculations.
- Round off all your calculations to two decimal places.
- Answer ALL the questions.

MEMO

GOOD LUCK!!

[TURN OVER]

QUESTION 1 [5]

Select the appropriate answer: Write only the appropriate letter next to the question number in your answer book:

1.1 E	Which of the following is (are) true regarding project products? A. Each project product has an activity(ies) that creates it B. All the deliverables are handed over to the client at the end of the project C. Deliverables are used to create intermediate products D. All of the above E. 1 & 2
1.2 A	The classical life cycle model of software development is: A. a reasonable approach when requirements are well defined. B. a good approach when a working program is required quickly. C. the best approach to use for projects with large development teams. D. an old fashioned model that is rarely used any more. E. none of the above.
1.3 C	The spiral model of software development: A. ends with the delivery of the software product. B. is more chaotic than the incremental model. C. includes project risks evaluation during each iteration. D. all of the above. E. none of the above.
1.4 D	Net Present Value takes into consideration the following items: A. Cash flow timing B. Net Profit C. Discount rate D. 1, 2 and 3 E. None of the above
1.5 A	The prototyping model of software development is: A. The best approach to use for projects with large development teams. B. A risky model that rarely produces a meaningful product. C. A reasonable approach when requirements are well defined D. A useful approach when a customer cannot define requirements clearly E. None of the above

QUESTION 2 [20]

2.1 The cash flows of Projects A, B and C is given in the table 1 below (in ZAR, South African rand, R):

Year	Project A	Project B	Project C
0	-R 250,000.00	-R 300,000.00	-R 200,000.00
1	R 25,000.00	R 25,000.00	R 40,000.00
2	R 25,000.00	R 50,000.00	R 40,000.00
3	R 50,000.00	R 75,000.00	R 40,000.00
4	R 50,000.00	R 50,000.00	R 40,000.00
5	R 100,000.00	R 50,000.00	R 80,000.00
6	R 100,000.00	R 75,000.00	R 80,000.00

Table 1 for Question 2

a) Give the formula to calculate Net Profit. Calculate the Net Profit of all the projects. Which of the projects have the highest Net Profit? (3)

Note: Net profit is the difference between total costs and total income over the life cycle of the project
Project A:
= (R25 000 + R25 000 + R50 000 + R50 000 + R100 000 + R100 000) - R250 000
= R350 000 - R250 000
= R100 000 √
Project B:
= (R25 000 + R50 000 + R75 000 + R50 000 + R50 000 + R75 000) - R300 000
= R325 000 - R300 000
= R25 000 √
Project C:
= (R40 000 + R40 000 + R40 000 + R40 000 + R80 000 + R80 000) – R200 000
= R320 000 – R200 000
= R120 000 (highest) √

b) Give the formula to calculate Return on Investment. Calculate the Return on Investment (ROI) of all the projects. Which of the projects have the highest return on investment? (7)

Return on investment (ROI) - also called Accounting rate of return (ARR):
(Is a way of comparing the net profitability to the investment required)
= (average annual profit/Total investment) x 100 √
Project A:
= ((100 000/6)/250 000 x 100) = 6.67% √√
Project B:
= ((25 000/6)/300 000 x 100) = 1.39% √√
Project C:
= ((120 000/6)/200 000 x 100) = 10% √√

c) Give the formula to calculate the pay back period. Calculate the pay back period of all the projects. Which of the projects pay back the quickest? (3)

Payback period is the time taken to break even or pay back the initial investment.
Payback period for project A is at the exact end of year 5, i.e., after exactly 5 years. √
Payback period for project B is exactly after 5 and 2/3 years (i.e, 5 years and 8 months). √
Payback period for project C is exactly after 4 and 1/2 years (i.e, 4 years and 6 months). √

d) Calculate the net present values of all the projects using a discount factor of 12%. Which project has the best NPV? (7)

Year	8% discount rate	10% discount rate	12% discount rate
0	1	1	1
1	0.9259	0.9091	0.8929
2	0.8573	0.8264	0.7972
3	0.7938	0.7513	0.7118
4	0.735	0.683	0.6355
5	0.6806	0.6209	0.5674
6	0.6302	0.5645	0.5066

Table 2 for Question 2.d: Table of Net Present Value Discount Factors

Net present value (NPV) Is a project evaluation technique that takes into account the profitability of the project and the timing of the cash flows that are produced. Note the NPV Discount factors below:

Year	NPV Discount factor (at 12% discount rate)	Project A	Discounted cash flow @12%	Project B	Discounted cash flow @12%	Project C	Discounted cash flow @12%
0	1	-250000	-250000	-300000	-300000	-200000	-200000
1	0.8929	25000	22322.5	25000	22322.5	40000	35716
2	0.7972	25000	19930	50000	39860	40000	31888
3	0.7118	50000	35590	75000	53385	40000	28472
4	0.6355	50000	31775	50000	31775	40000	25420
5	0.5674	100000	56740	50000	28370	80000	45392
6	0.5066	100000	50660	75000	37995	80000	40528
NPV		217017.5 - 250000 = **-32982.50**		213707.5 - 300000 = **-86292.50**		207416 - 200000 = **7416**	

Project C – best NPV √ √√ √√ √√

QUESTION 3 [14]

3. In the PERT network illustrated in the figure below, the target date for the completion of the project is 15 weeks.

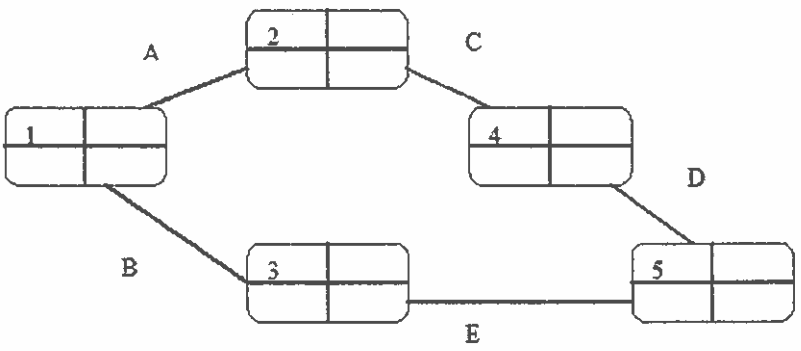


Figure 1: Pert network for Question 3

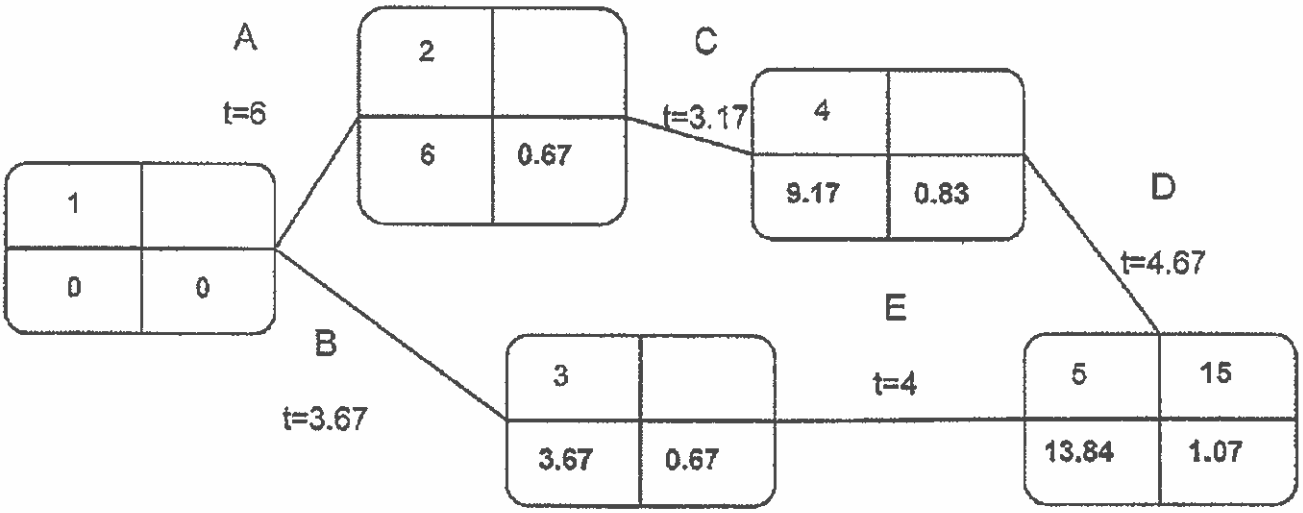
	Optimistic (a)	Most Likely (m)	Pessimistic (b)	Expected (t_e)	Standard Deviation (s)
A	4	6	8		
B	1	4	5		
C	2	3	5		
D	2	5	6		
E	3	4	5		

Table 3 for Question 3

Use the table above to calculate the following:

3.1 Calculate the Expected (t_e) values and Standard Deviation (s) and indicate the (t_e) and (s) values on the diagram. (10)

	Optimistic (a)	*Most Likely (m)*	*Pessimistic (b)*	*Values*	*Expected (te)*	*Values*	*Standard Deviation (s)*
A	*4*	*6*	*8*	*=(4+(4*6)+8)/6*	*6.00*	*=(8-4)/6*	*0.67*
B	*1*	*4*	*5*	*=(1+(4*4)+5)/6*	*3.67*	*=(5-1)/6*	*0.67*
C	*2*	*3*	*5*	*=(2+(4*3)+5)/6*	*3.17*	*=(5-2)/6*	*0.50*
D	*2*	*5*	*6*	*=(2+(4*5)+6)/6*	*4.67*	*=(6-2)/6*	*0.67*
E	*3*	*4*	*5*	*=(3+(4*4)+5)/6*	*4.00*	*=(5-3)/6*	*0.33*



3.3 Calculate the Z value on the last event. (4)

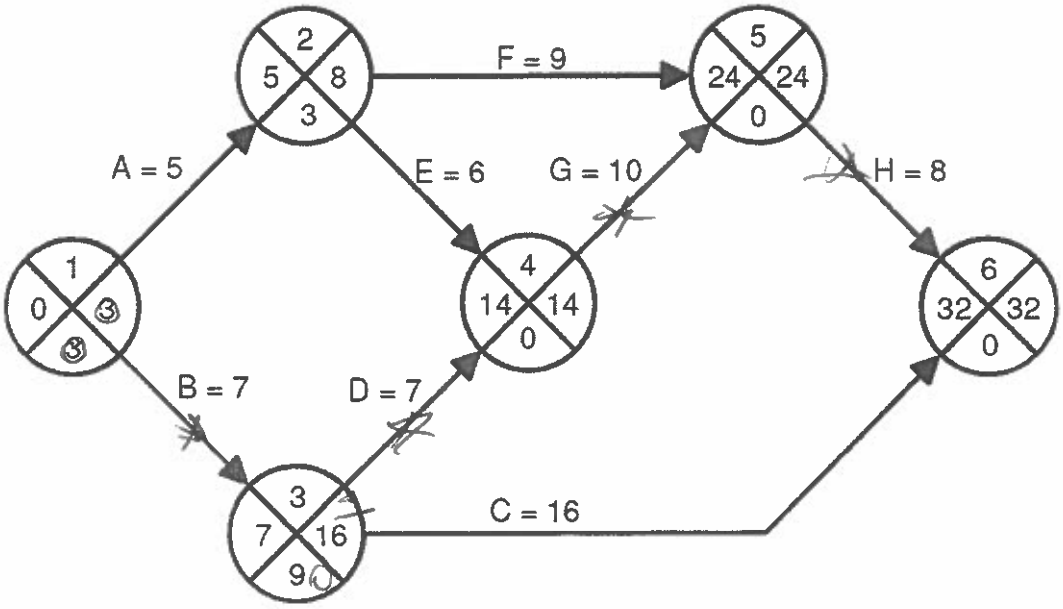
Z = (T-te)/s √
Z = (15-13.84)/1.07 √√
= 1.084112 √

QUESTION 4 [28]

4.1 Consider the following list of tasks with dependencies and estimated durations reflected in the table. Draw a CPM network (activity-on-arrow diagram) to illustrate the interaction of activities. (8)

Task	Precedents	Duration (weeks)
A	None	5
B	None	7
C	B	16
D	B	7
E	A	6
F	A	9
G	D, E	10
H	F, G	8

Table 4 for Question 4



4.2 Write down the critical path using the letters of the tasks and calculate and write down the duration of the project. How many paths are there in total? Identify them all and write them down. (3)

Critical path: *B-D-G-H* ✓

Project duration: *32 weeks* ✓

Number of paths: *4 paths, namely:* ✓

A-F-H

A-E-G-H

B-D-G-H

B-C

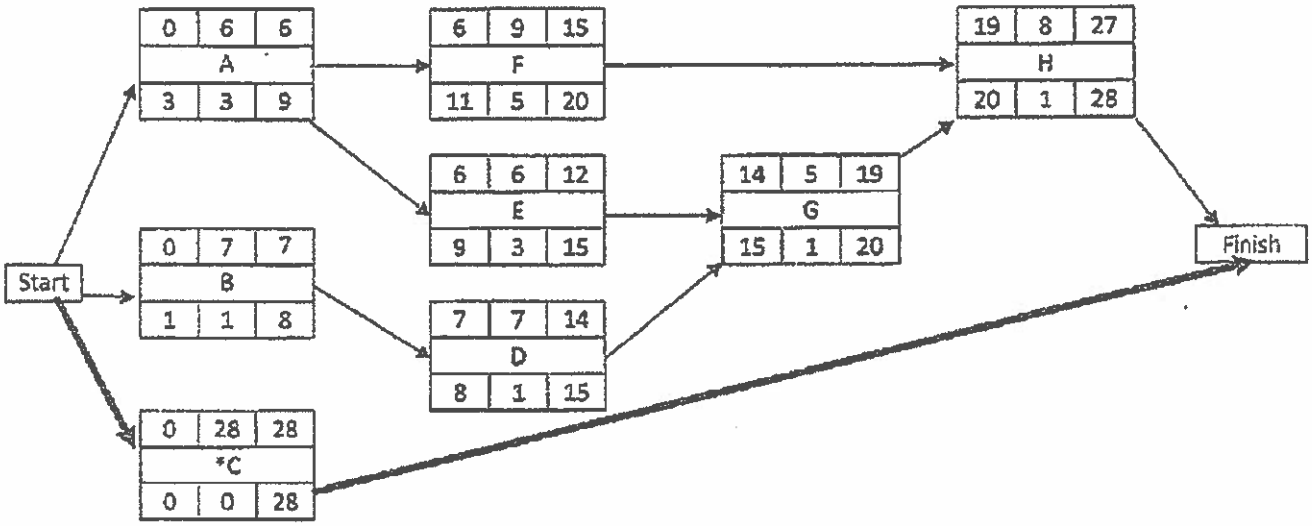
4.3 What will the effect on the project be if the duration of activity A changes to 8 weeks? (2)

Duration still 32 weeks, but now two critical paths: A-E-G-H and B-D-G-H (✓)√√

4.4 Due to the advent of new technology the following changes will occur:

- Task A duration changes to 6 weeks
- Task G duration changes to 5 weeks
- Task C is no longer dependent on the completion of Task B
- Task C duration changes to 28 weeks

Draw the activity-on-node network (precedence network) diagram for the tasks as given in the table, incorporating these changes. Indicate **all** the node values on the nodes. Indicate the critical path with a * on each task in the path. (12)



4.5 Summarise the overall effect of the changes in 4.4 compared to the scenario in 1.1 and indicate whether the change in technology should be implemented or not. (3)

Critical path: *Changes from B-D-G-H ✓to C✓*

Project duration: *Decreases from 32 weeks ✓to 28 weeks✓*

Decision: *The change in technology should be implemented since the overall duration of the project is decreased by 4 weeks. ✓* √√√

QUESTION 5 [13]

5.1 Below is partial precedence network for an IT project. Specific individuals have not been allocated to activities yet, but all the activities will be carried out by 'standard' analysts or software developers. Draw up a bar/Gantt chart and resource histogram for the information given in the precedence network below. (10)

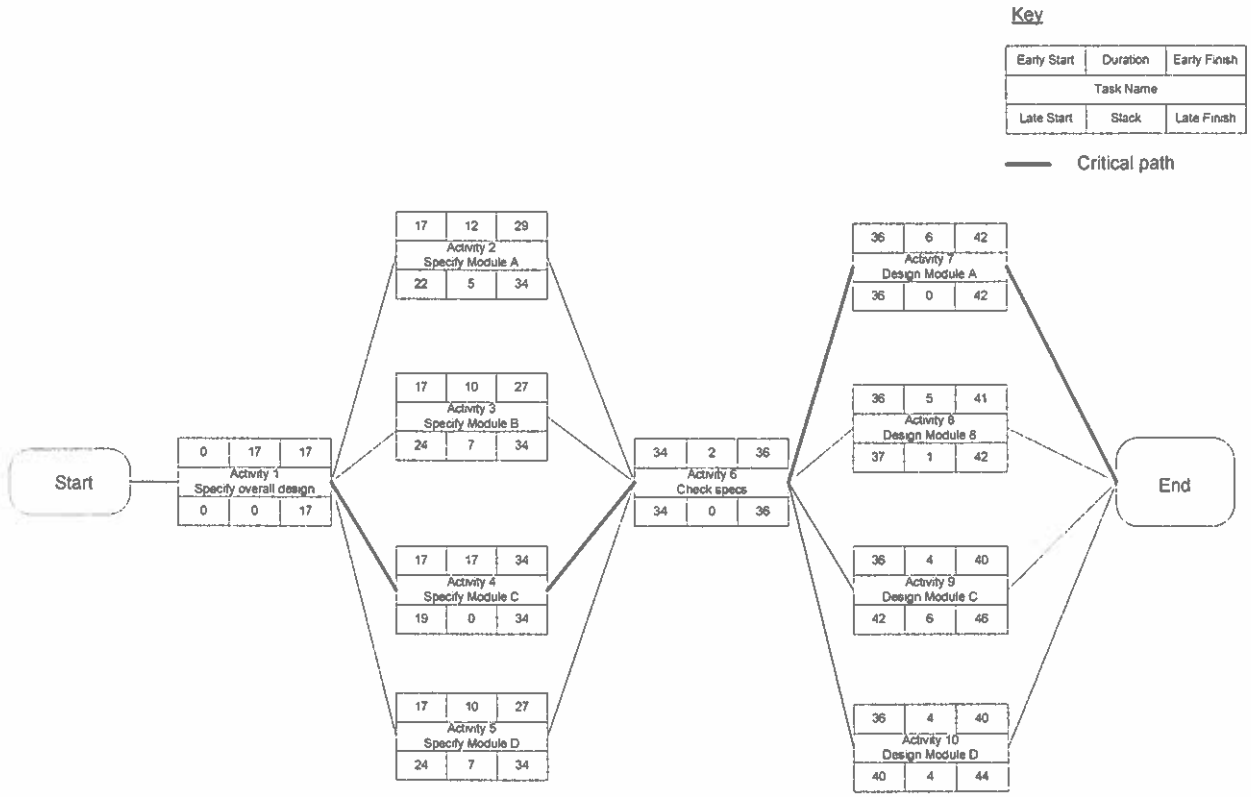
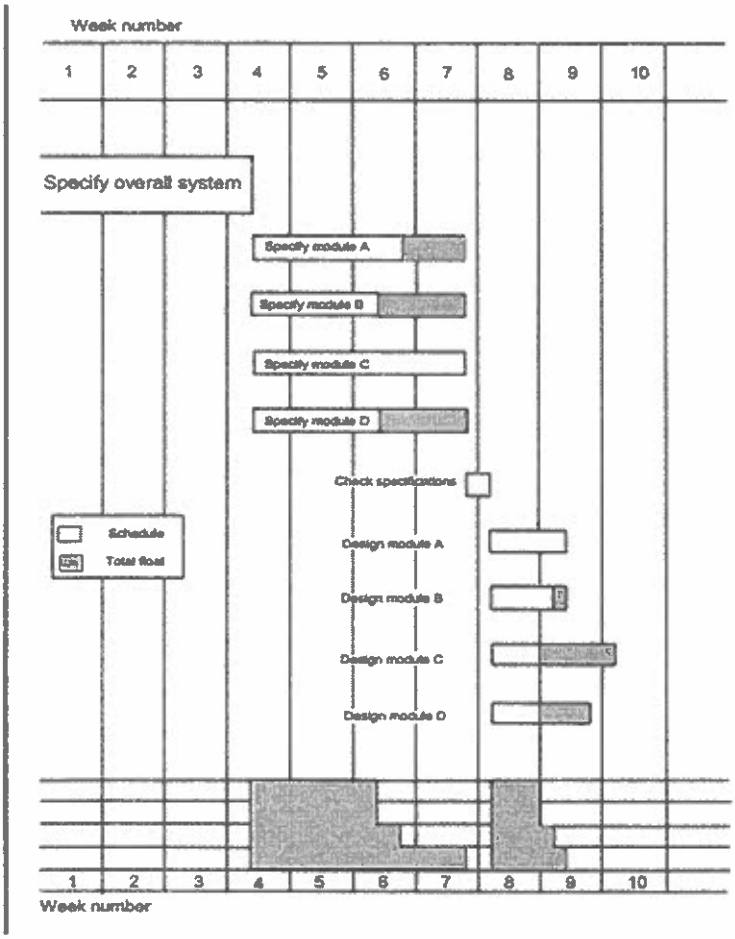


Figure 2 for Question 5: Partial precedence network



5.2 Name and describe three ways that a manager can use to visualize projects progress. (3)

✓Gantt chart
✓Slip chart
✓Timeline chart
✓Ball charts

Any correct three √√√