No.

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CV4611 - Project Planning and Management (Nov/Dec 2016)

Question 1

(a) Specification is part of the contract documents which sets out the scope of works and a detailed description of the nature and quality of the materials and workmanship to be complied with in the execution of works.

Usually includes these three headings: General Requirement, Standards and samples, Materials and workmanship

(i) General Requirement - deals with general matters relating to the works
- Eg: Location of site, Site records, Site water and electricity supplies, Engineer's site office

(ii) Standards & samples - contains only a shortlist of clauses directed at the general aspects of the materials and workmanship specification
- Eg. - Drawings, bill of quantities need to comply with relevant British standards.
- Requirements for samples of materials to be employed on works to be submitted to the engineer for his approval

(iii) Materials and workmanship - cover every aspect of the quality of materials and standard of workmanship for the permanent work to be constructed on the works
Eg Concrete and reinforced concrete, specification needs to cover: portland cement, aggregates, workability, reinforcement etc.

To ensure the success of works executed, specification should
- no overlaps or conflicts with other specifications
- no redundancy or duplication
- no ambiguity
- no contradiction
- practicality and guarantee
- safety provision
- check against BS for materials/works

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(b) General conditions of contract define the terms under which the works are to be executed and maintained and set forth the obligations and liabilities of the parties to the contract

5 facets : Policy in relation to the contract , Execution of works , time within which works are to be executed , payment for the work carried out , default and disputes arising from contract

Examples :

(i) Policy in relation to the contract

- Contractors are required to obtain engineer's written consent before sub-letting any part of work
- Empowers engineer to order any variation to any part of the works which in engineer's opinion is necessary for the completion of the works

(ii) Execution of the works

- Contractor's general responsibilities are set out (responsibility towards safety of site and operations)
- Empowers engineer to order the contractor to remove or make good improper work or materials which are not in accordance to standard

(iii) Time within which works are to be executed

- Date of commence of works will be notified by engineer to contractor in writing
- procedure for granting extension of time for completion

(iv) Payment of work executed

- Engineer need to ascertain and determine the value of work done in accordance with contract
- Payment method to subcontractors

(v) default and disputes

- Imposition of liquidated damages on the contractor for failing to complete the work within time prescribed in contract

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Question 2

(a) (i) Fiduciary trust. trustee of clients

(ii) Confidential keep key information from clients as confidential

(iii) Ethical moral behavior to be kept ethical

(b) (i) Dangerous building (arising from condition), CBC on order
- owner to carry out inspection
- to execute necessary works to abate danger
- to demolish the building or part thereof

Dangerous building (arising from overloading), CBC can
- require owner to restrict the use until the building is made structurally adequate for the loading envisaged

Dangerous building (emergency case), CBC can take steps for:
- closure of building
- strengthening the building
- demolition of the building and CBC may recover all expenses from owner

(ii) Accredited checker's role in construction Project
- check that the design calculations and the plans of building works prepared by the QP for structural works conform to the design codes of building works
- Evaluate, analyze and review the structural design in connection with a proposed building works with a view to determining adequacy of the structural elements
- verify that the key structural elements designed are consistent with the layout shown on the architectural and building plans
- if all criteria is satisfied, issue a certificate to show that to the best of his knowledge and belief, the plans do not show any inadequacy in the key structural elements

(iii) A Professional Engineer who owns a unit in a condominium can not carry out building inspection on the condominium as inspection can only be carried out by
- A registered PE in the civil or structural engineering discipline
- He/she must not have any professional or financial interest in the building

(iv) CBC can revoke the permit for carrying out building work if:
- works after commenced, suspended for more than 3 consecutive months without valid reason
- building works are not carried out in proper manner (may cause injury to people or damage to other property or the building is likely to collapse)
- Permit is considered automatically lapse if any of the key party (owner, QP, builder) cannot function as one

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(c) Singapore planning Act is to provide law on planning and improvement of Singapore in general land use, on matters relating to master plan, development of land and development charge. The development proposal need to be approved by Competent Authority before any development is carried out.

Application: Outline Planning Application and written Permission Application

After obtaining written / provisional permission, developer and his consultants can proceed to submit documents for Building Plan Approval which is governed by Building Control Act.

Main functions of BC Act:

- approval of building plans
- granting permit to commence building works
- appointment and control of Accredited checkers
- control over functions of Qualified persons
- control over functions of site supervisors
- permit for Occupation of buildings
- inspection of buildings

For a new construction projection for developing a piece of land in Singapore, the developer first need to apply for written permission to develop the land, which is governed by Singapore Planning Act. When approval is granted, developer needs to submit architectural building plans, engineer's structural plans and AC's certificate of adequacy to apply for approval of Building Plans, which is controlled by Building Control Act with all the approval of the application, a construction project only can be commenced

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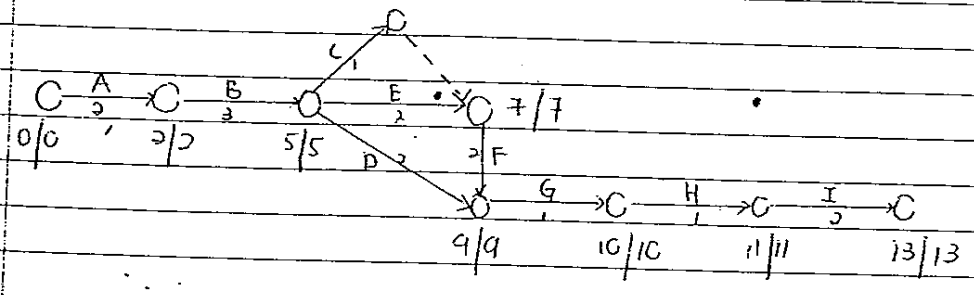
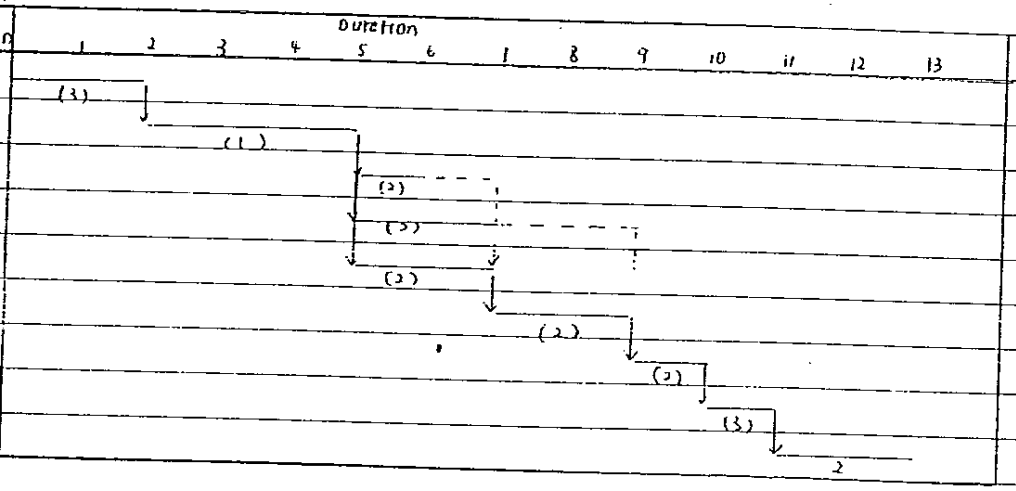
Question 3(a)

CPM project network



Linked Bar chart

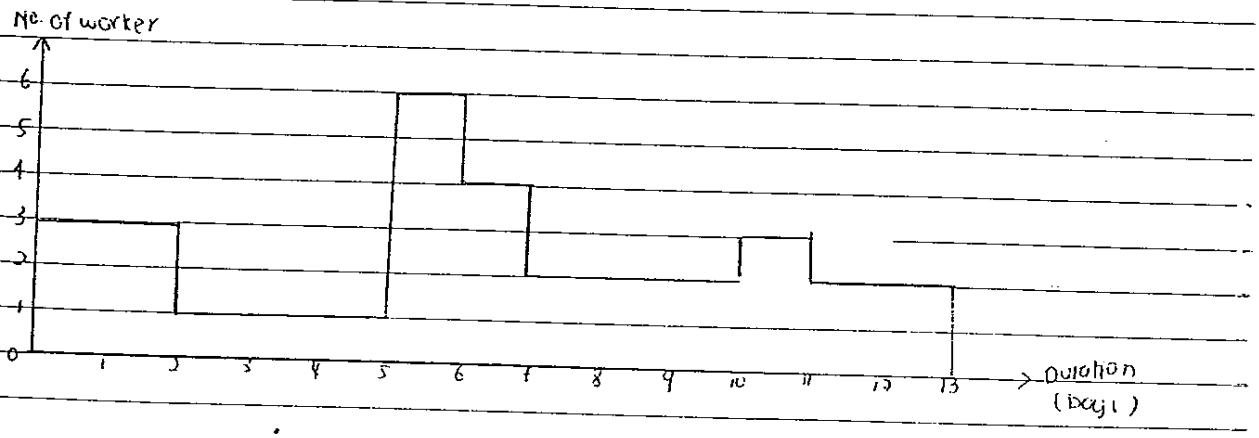
Activity	Duration
A	2
B	3
C	1
D	3
E	2
F	2
G	1
H	1
I	2



project Duration : 13 days

Critical path= A - B - E - F - G - H - I

Manpower Histogram



Peak manpower during Day 6

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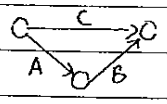
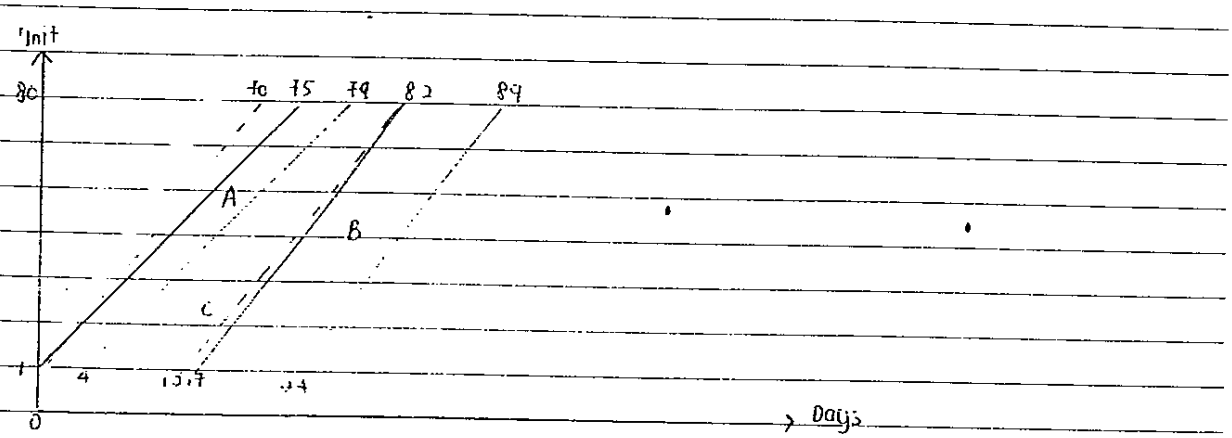
Question 3(b)

N = 80 R = 7/week h = 8 hours/day d = 6 days/week Buffer = 3 days



Operation	Man-hour	optimum Team Size	Theoretical Gang Size	Actual gang size	Actual Build Rate	Time for operation	Time between 1st and last unit
	M	Q	$G = \frac{Rm}{dh}$	g	$U = \frac{g}{G} R$	$T = \frac{M}{8h}$	$S = \frac{79}{U} \times d$
A	150	5	21.875	20	6.4	4	75
B	496	8	6.25	6	7.31	7	65
C	920	10	134.17	130	6.48	12	70



(i) Project Completion Time : Day 89

(ii) If actual gang size of operation C = 100 (10 teams),
U = 5.22 S = 91, completion day of operation D is Day 103,
The project completion time will be delayed to Day 103 as well.

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Question 4(a)

(i) Direct cost : Payment to sub-contractor : 330,000
Cost of labor : 710,000
Cost of equipment : 250,000
Cost of materials : 950,000
Total : 2140,000

Indirect cost : salaries of site staff : 150,000
Provision of site facilities : 120,000
Total : 270,000

→ Total project cost = $ 2410,000

Total value of project : value claimed to date + value of final claim (yet to be made)
= 2500,000 + 250,000
= $2750,000

(ii) % mark up = $\left(\frac{\text{value}}{\text{cost}} - 1\right) \times 100$
$= \left[\left(\frac{2750,000}{2410,000}\right) - 1\right] \times 100$
= 14.1 %

(iii) Contribution = value - cost = 2750 000 - 2410 000
= $340,000

Profit = Contribution - overhead = 340,000 - 120,000
= $ 220,000

(iv) Amount received from owner to date = volume claimed to date - Retention
Retention = 10% of value ... (≤ max of 5% of project value)
= 0.1 x 2500,000
= 250,000
check against maximum retention : 0.05 x Project value
= 0.05 x 2750,000
= 137,500
⇒ max retention = $ 137,500

Amount received from owner to date = 2500,000 - 137,500
= $ 2362,500

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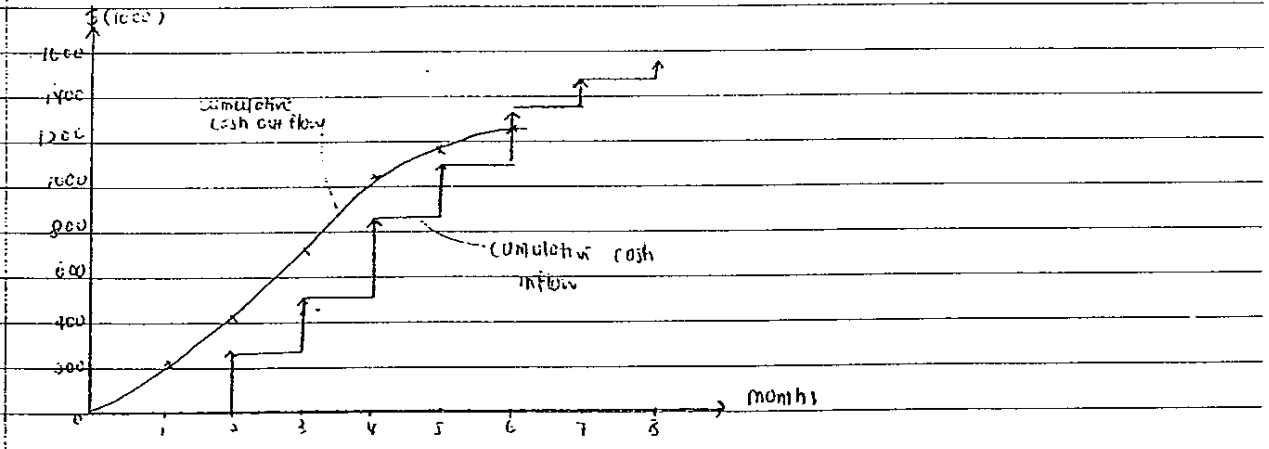
Question 4(b)

(i)

Project Time in Months									
Cost Information	0	1	2	3	4	5	6	7	8
Direct Cost	193 000	193 000	287000	287000	95000	95000			
Indirect Cost	16 000	16 000	16 000	16000	16000	16000			
Total cost	209 000	209 000	303000	303 000	111 000	111 000			
Cumulative Cost	209000	418 000	721000	1024000	1135000	1246000			
Monthly Value	271700	271700	363 600	363 600	133500	133500			
Cumulative Value	271700	543400	907 000	1270 600	1403 800	1537000			
Cumulative Retention	27170	54340	80 000	80 000	80000	80000			
Cumulative Payment Received	244530	489060	827000	1190 600	1323800	1457000			
Cumulative Cash Inflow	0	244530	489060	827000	1190 600	1323800	1457000	1537000	
Cumulative Cost Outflow	209000	418 000	721000	1024000	1135000	1246000			
working capital:									
Before Payment	-209000	-418 000	-476470	-534940	-308000	-55400	77800	211000	
After Payment	-209000	-173470	-231940	-197 000	556 00	77 800	211000	291000	



(ii) Assume all working capital borrowed from bank will be paid by end of 8th month (after receiving retention from owner)

Gross profit = Total value - Total cost = 1537000 - 1246 000 = 291000

Interest payable = $[209000\ (1.015)^5 - 209000] + [418000(1.015)^4 - 418000]$

$+ [476470(1.015)^6 - 476470] + [534940(1.015)^5 - 534940]$

$+ [308\,000(1.015)^4 - 308000] + [55400(1.015)^3 - 55400]$

$= 26436.95 + 45915.17 + 44522.9 + 41342.31 + 18899.97 + 2530.58$

$= 179\,647.88 \approx 179648$

Profit = 291000 - 179648 = $ 111 352