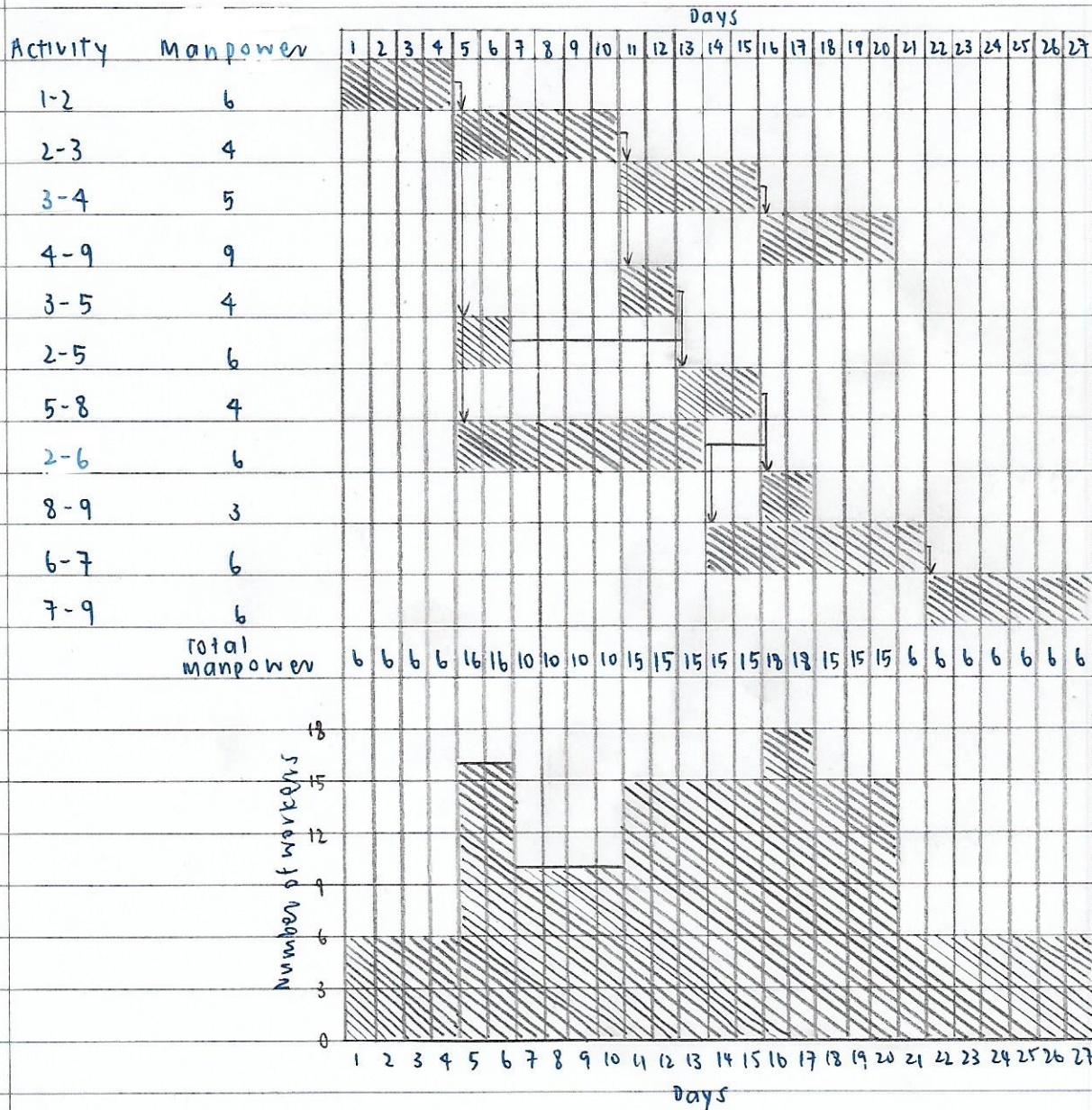
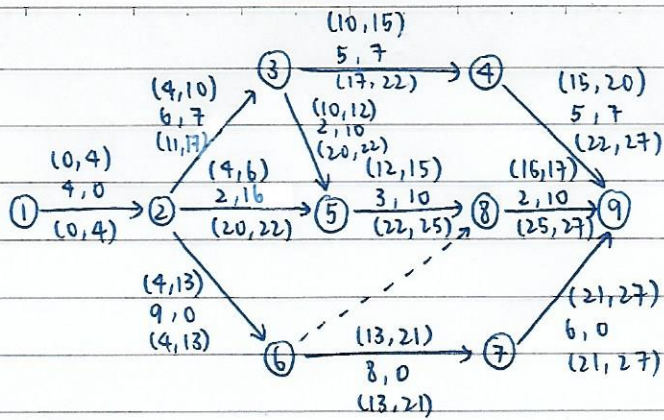


## CV4011 Project Planning & Management PYP 18/19 Semester 1

- 1(a)(i) Not appropriate. PE should refrain from publicly expressing an opinion on an engineering project without fully knowing all the facts [2(4)] and criticising the work of another PE [2(5)].
- (ii) Not appropriate on two levels. Firstly, PE must act with prime regard to public interest, and strongly recommending the steel grade below specifications may pose a hazard that endangers the safety of future building occupants. Secondly, PE must discharge his duties to his employer with complete fidelity and cannot personally profit by accepting a bribe.
- (b)(i) CBC must issue a certificate of statutory completion of the building before it can be occupied. TOP (Temporary Occupation Permit) can be used before the CSC is granted.
- (ii) AC is needed as an independent party appointed by the developer to check and approve the designs submitted by QP (Design), who is often appointed by the builder.
- (iii) Any building erected in contravention of the Building Control Act will be deemed unauthorised and must be demolished.
- (c) Not appropriate. There is conflict of interest as Thomas is a representative from the original consultant firm. The inspection PE should be advised to thoroughly inspect the condominium and make his own judgment on whether or not to endorse, rather than being influenced by the managing partner of XYZ. However, the managing council should have appointed a completely different consultant firm for the periodic inspection.
- 2(a)(i) Objectives:
- Meet and programme rate of completion
  - Carry out repetitive work at uniform rate
  - Move labour and plant through project in a continuous manner
  - Achieve productivity and financial benefits from repetitive nature of work
- Conditions:
- A few repetitive activities with large quantities of each activity
  - Linear construction process
  - Processes done by specialist gang
- (ii) Stages:
- Calculate actual gang size ( $g$ ), duration per unit ( $T$ ) and duration from the start of the 1<sup>st</sup> unit to the start of the last unit ( $S$ ) for each activity
  - Determine start and finish days of each activity
- Data needed:
- Required man-hours per unit ( $M$ )
  - Optimum team size ( $Q$ )

- Target output rate (R)
- Minimum buffer (B)
- Number of workdays per week (d)
- Number of work hours per day (h)

2 (b) (i)



(ii) Delay Activity 2-3 by 2 days to avoid coinciding with Activity 2-5.  
 Delay Activity 8-9 by <sup>a further</sup> 5 days to avoid coinciding with Activity 4-9.

3(a)(i) Total project cost  
 = Cost of materials + cost of labour + cost of equipment + payment to subcontractor  
 = 950,000 + 710,000 + 250,000 + 230,000  
 = \$2,410,000

Total value = 2,500,000 x 10/9 + 280,000  
 = \$3,057,778

(ii) Percentage mark-up =  $(3,057,778 - 2,410,000) / 2,410,000 \times 100\%$   
 = 26.9%

(iii) Contribution = Gross profit  
 = 3,057,778 - 2,410,000  
 = \$647,778

(b) The all-normal project duration is the time taken to complete the project at the lowest feasible direct cost. However, indirect costs are also incurred for every additional day that the project is ongoing. Additional direct costs (e.g. overtime pay, shift work, increased equipment costs) may be incurred to speed up activities along the critical path(s) and shorten the overall project duration such that the increase in direct costs (cost slope) is still less than the indirect costs that would have been incurred for the additional time. This is known as crashing. Thus, the overall costs are said to be optimised at the shorter project duration.

Procedure:

- Determine range and cost slope of each activity
- Determine all-normal solution, network diagram and cost
- First compression
- n<sup>th</sup> compression
- Final duration, critical paths and project cost

(c) Financial planning

- Cash flow analysis
- Cash flow forecasting

Cost control

- Cost estimation
- Budget determination
- Actual expenditure at site – possible deviations from budget include:
  - Material (escalation of price, wastage)
  - Labour/equipment (different output rate, increase in hire rate)
  - Error in estimation (incomplete information during bidding, outdated/inappropriate databases, human error)

Measures to reduce working capital requirements

- Arrange adequate short-term financing facilities
- Not taking up new projects that drain cash flows

- (During tender stage) unbalance bid to increase early cash flows

#### Sources

- Company internal funds
- Bank overdrafts (short term borrowing)

#### 4(a)(i) 1. Offer and acceptance

An offer is considered to be made when one person (party) signifies to another person (party) a willingness to enter into a binding contract on certain specified terms. An acceptance creates the contract, provided that it is made in the manner and at the time specified in the offer.

#### 2. Meeting of the minds

Contracting parties must agree on the basic meaning and legal implications of the contract.

#### 3. Consideration

Consideration is something of value. It is the primary reason or main cause for a person (or party) to enter into a contract. It is something of value received by one of the parties in exchange for another item or action that is of value. Both parties to a contract must obtain consideration. Otherwise, the contract is not valid.

#### 4. Lawful subject matter

The subject must be clearly defined in existence. It cannot violate any fundamental dictates of common law or public policy.

#### 5. Competent parties

Anyone, with a few exceptions (infants or not mentally competent), acting in good faith may enter into a binding contract. If one of the two contracting parties is judged to be incompetent, the contract can be nullified.

- (ii) In a unilateral contract, the promise is made by only one party, who has an open request in which they are willing to perform a particular act conditional upon a specified payment (or, conversely, pay for a specified act). For example, a landscaping subcontractor may offer a general package where he will sell 100 landscaping railroad ties for \$6 each. If a contractor sends the subcontractor a cheque for \$600 for those ties, a contract will be formed.

- (iii) An implied contract is one in which the terms of the agreement are not clearly stated (either verbally or in writing) but are established through inference and deduction through the actions of the parties involved. For example, a contractor may have engaged a architectural subcontractor for 12 months, which was the estimated duration of a project. If the project was delayed to 14 months, the extension of contract may be implied, and the contractor should continue to pay the subcontractor for the additional 2 months of work.

#### (b)(i) 1. General Contract

It consists of a contract drawn up between the owner and a general contractor. The owner is responsible for drawing up the contract documents. The owner's representative is usually an architectural design firm. The owner will enter into two separate contracts, one with the designer and the other with the constructor.

## 2. Separate Contract

The owner lets contracts directly to specialty contractors for various portions of the work. The owner must take charge of the management of the project, assuming the managerial functions performed by the general contractor.

## 3. Self-Performance Method

No contracts are written for a construction project. The owner's own workers or employees are solely assigned to the task of performing the construction work.

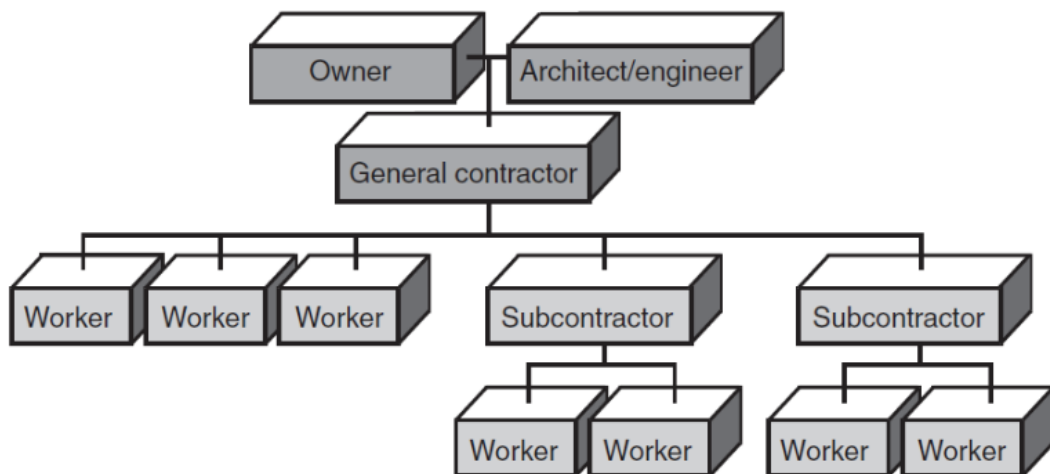
## 4. Design-Build Method

The owner lets a single contract for both the design and the construction of a project.

## 5. Professional CM Method

The professional CM firm is generally hired by the owner before any substantial design work is done and before any construction work has begun.

(ii)



(iii) Advantages (choose 2):

- The Owner has an ally to oversee the construction process using professional CM's expertise.
- A party with construction expertise is employed to monitor the design as it evolves.
- This helps assure a design that can be constructed more easily and at a reduced expense.

(c) (i) A balanced bid is one in which the anticipated costs for the various bid items are accurately reflected in the unit prices that are submitted. Unbalancing a bid is a method used by some contractors in which the unit prices of the various bid items are altered so that they do not reflect the true costs of those items.

- (ii) Positive Cash Flow: Increase the price of work units that are performed early in the construction process.

Owner's Estimation Error: The contractor feels confident that more work units will be encountered than the owner has estimated.

- (iii) Choose 2:

- Interpret an obviously unbalanced bid as being irregular and, on those grounds, reject the bid.
- Renegotiate if the actual quantity varies from the estimated quantity by more than a stated percentage, typically 20 to 25 percent.
- Resort to a change order that will delete a grossly unbalanced bid item. This may constitute a breach of contract if the deleted work is a large portion.

- (d)(i) Unit Price:

Used when the project is fairly well-defined in terms of components

- (ii) Cost-Plus:

Used when the actual costs of a project are difficult to estimate with accuracy

- When a project is to be completed within a fairly short time period (e.g., emergence related construction)
- When the true nature cannot be accurately described before construction begins (e.g., decoration, renovation)

- (iii) Lump Sum:

- The entire design is completed before construction is to begin
- All quantities can be accurately established are ideal for award by lump sum contract
- Owners with a limited budget (minimal staffing requirements)

- (iv) Ad hoc work such as renovation, repair or maintenance

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