

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2020**

CONSTRUCTION MANAGEMENT AND SAFETY ENGINEERING

[Maximum Marks: 75]

[Time: 2.15 Hours]

PART-A

(Answer *any three* questions in one or two sentences. Each question carries 2 marks)

- I. 1. Define total float and free float.
2. What is a tender?
3. Define Economic Order Quantity.
4. List any four types of earth excavating equipments.
5. Define TQM. (3 x 2 = 6)

PART-B

(Answer *any four* of the following questions. Each question carries 6 marks)

- II 1. Distinguish between administrative sanction and technical sanction.
2. What are the limitations of bar chart?
3. List the various steps in departmental execution of works.
4. What are the information included in a tender notice?
5. Write any six objectives of material management.
6. Compare entrepreneurial style with managerial style.
7. State the role of supervisor in maintaining safety at construction site. (4 x 6 = 24)

PART-C

(Answer *any of the three units* from the following. Each full question carries 15 marks)

UNIT – I

III (a) A project consists of activities as shown below.

Activity	1-2	1-3	2-3	3-4	4-5	1-5	5-6	6-7
Duration in days	1	5	3	3	1	12	3	1

- (i) Draw the project network.
- (ii) Calculate all the activity times and floats.
- (iii) Compute the critical path and project completion time. (8)
- (b) Explain the functions of construction management. (7)

OR

- IV (a) Explain the job layout at construction site with a neat sketch. (7)
- (b) Discuss the features of a construction project. (8)

UNIT – II

- V (a) Explain the rules for taking measurements in M-book. (8)
- (b) Explain the merits and demerits of percentage rate contract and cost plus fixed fee contract. (7)

OR

- VI (a) Explain the different modes of payment. (8)
- (b) Explain the role of specification in construction activities. (7)

UNIT- III

- VII (a) Explain the different stages of HR procurement. (9)
- (b) Explain the functions of store management. (6)

OR

- VIII (a) Explain the factors related to selection of equipment. (8)
- (b) Discuss the various labour welfare measures. (7)

UNIT - IV

- IX (a) What are the safety practices that are to be followed during:
 - (i) Excavation work. (ii) Demolition. (8)
- (b) Explain any seven elements of TQM. (7)

OR

- X (a) Discuss the role of entrepreneurs. (8)
- (b) Discuss the merits and demerits of ISO 9000 standards. (7)

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CONSTRUCTION MANAGEMENT AND SAFETY ENGINEERING

[Maximum Marks: 75]

ANSWER KEY

[Time: 2.15 Hours]

PART-A

(Answer *any three* questions in one or two sentences. Each question carries 2 marks)

I. 1. Define total float and free float.

TOTAL FLOAT - The difference between the maximum time allowed for an activity and its estimated duration is called total float

➤ FREE FLOAT- The duration of time by which the completion time of an activity can be delayed without affecting the start of succeeding activities is called free float

2. What is a tender?

It can be defined as an offer in writing to execute specified works or to supply materials at certain rates within a fixed time

3. Define Economic Order Quantity - Economic order quantity (EOQ) is the ideal order quantity a company should purchase to minimize inventory costs such as holding costs, shortage costs, and order costs.

4. List any four types of earth excavating equipments – Grader, Shovel, Dragline, Clamshell

5. Define TQM - It is the process involving all levels in an organization to achieve customer satisfaction with respect to quality, price and delivery. (3 x 2 = 6)

PART-B

(Answer *any four* of the following questions. Each question carries 6 marks)

II 1. Distinguish between administrative sanction and technical sanction. 3+3=6

ADMINISTRATIVE SANCTION ➤ Formal acceptance of proposed work or project by the competent authority ➤ It is the duty of concerned department ➤ Approval given based on approximate estimate and preliminary plans ➤ After AS is given, the Engg Dept. takes up the work and prepares detailed plans, designs and estimates.

TECHNICAL SANCTION ➤ For every works except petty works, a properly detailed estimate must be presented for sanction by the competent authority of engineering department. ➤ This sanction guarantees that the proposals are structurally sound, and estimates are accurate ➤ After TS of estimate is given, work is taken up for construction.

2. What are the limitations of bar chart? (4 X 1.5 = 6)

The chart is only suitable for small and simple jobs. • uncertainties • The sequence of activities is not clearly defined. • The various activities are inter dependent

3. List the various steps in departmental execution of work



(1 X 6 = 6)

4. What are the information included in a tender notice?

Details included in tender notice

1. Name of department calling for tenders
2. Name and location of work
3. Time of completion of the work and the type of contract
4. Period of availability of tender form
5. Last date and time of receiving the tender form
6. Date, time and place of opening tender form
7. Cost of tender form
8. Earnest money deposit to be paid
9. Designation of officer calling for tender
10. Designation of officer opening tender

(1 X 6 = 6)

5. Write any six objectives of material management.

- *Economy in material cost.*
- *Efficient control of inventories.*

- Ensure uniform flow of material for construction.
 - Ensure right quality at right place.
 - Establish and maintain good relationship with customers.
 - Economical consumption of important items and finding their substitutes. (1 X 6 = 6)
6. Compare entrepreneurial style with managerial style. (1X6 = 6)

Managerial

- Overall business activity which is getting done through and with people in formally organized group.
- Focus on managing an ongoing operation
- Management is an employee of the organization.
- Salary as reward for work
- Management does not accept any risk
- Make decision after collecting detailed information and reaching conclusion.
- Management executes the innovative idea.
- Normal ambition
- Experience makes balanced attitude.

Entrepreneurial

- Process of creating an enterprise by taking the financial risk in order to get the profit .
- Focus on new business venture .
- Ownership of an organization stays with an entrepreneur
- Profit is the rewards for the work
- Entrepreneur is the risk taker
- Make decision on personal interest .
- Entrepreneur is the innovator of ideas
- Strong ambition
- Overall confidence .

7. State the role of supervisor in maintaining safety at construction site. (1 X 6 = 6)

- **Responsibilities:**
 - Develop Safety Programs
 - Eliminate Unsafe Practices and Equipment
 - Conduct Orientation and Training of Employees
 - Enforce Safe Work Practices:
 - Correct Unsafe Conditions:
 - Investigate Workplace Accidents
 - Communicate about safety policies to the employees
 - Monitor health and safety of employees
 - Provide first aid to the injured persons
 - Should maintain suitable rescue equipment in an efficient state
 - Provide and enforce the use of personal protective equipment (PPE)

(4 x 6 = 24)

PART-C

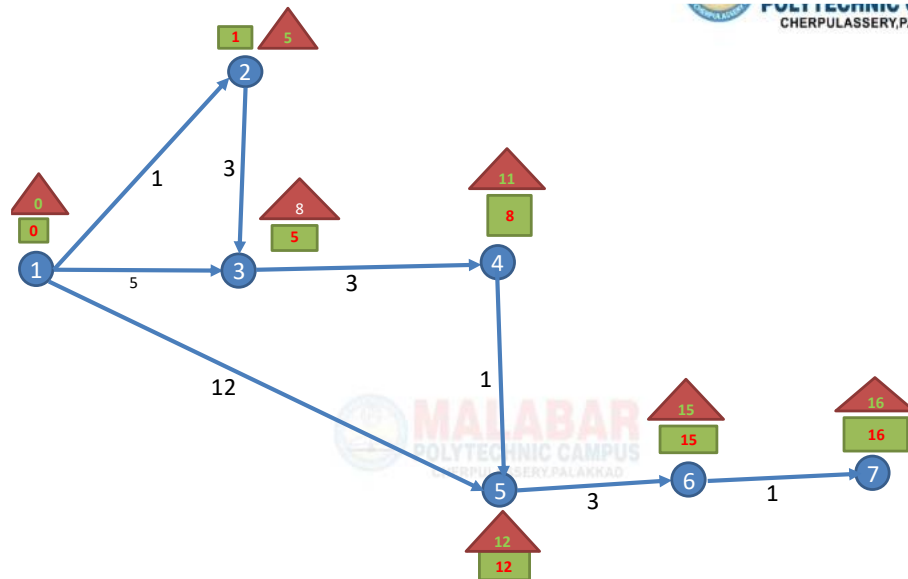
(Answer *any of the three units* from the following. Each full question carries 15 marks)

UNIT – I

III (a) A project consists of activities as shown below.

Activity	1-2	1-3	2-3	3-4	4-5	1-5	5-6	6-7
Duration in days	1	5	3	3	1	12	3	1

- (i) Draw the project network.
- (ii) Calculate all the activity times and floats.
- (iii) Compute the critical path and project completion time. (8)



CALCULATIONS

1. EST = TE value of first event
2. EFT = EST + duration
3. LFT = ▲ TL value of second event
4. LST = LFT – Duration
5. TF = LST – EST or LFT – EFT

Act ivity	DU RA TIO N	EST	EF T	LF T	LST	TF	RE MA RKS
1-2	1	0	1	5	4	4	
1-3	5	0	5	8	3	3	
2-3	3	1	4	8	5	3	
3-4	3	5	8	11	8	3	
4-5	1	8	9	12	11	1	
1-5	12	0	12	12	0	0	CP
5-6	3	12	15	15	12	0	CP
6-7	1	15	16	16	15	0	CP

- Critical path is: 1-5-6-7
- Project duration: 12+3+1=16

(b) Explain the functions of construction management.

- Planning - It is the basic function of management and it is a must in any activity.
- Scheduling - Fitting of the final work plan to a time frame indicating the start and completion of each activity
- Organizing - Division of total construction works to manageable departments and systematically arranging various operations by giving tasks to individuals
- Staffing - Staffing is an operation of recruiting the employees by evaluating their skills,

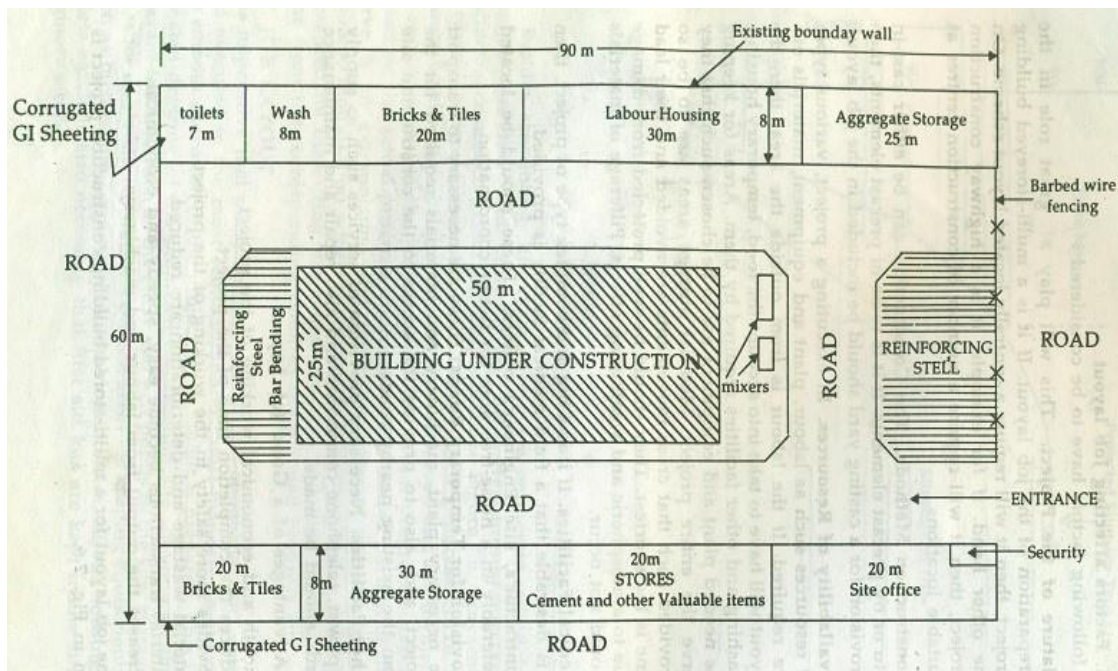
knowledge and then offering them specific job roles accordingly.

- Directing - Training subordinates to carryout assigned tasks, supervising their work, and guiding their efforts
 - Controlling - Constant review of the work plan to check on the actual achievements and to discover and rectify deviations through appropriate corrective measures.
 - Co-ordinating - Bringing together and coordinate the work of various departments and sections.
- (7)

OR

IV (a) **Explain the job layout at construction site with a neat sketch.**

A scaled drawing of proposed construction site ➤ It shows all the relevant features such as entry and exit points to the site, contractors' offices, storage areas for materials areas for keeping equipment such as bar bending area, mixers, labor housing, toilets, washing facilities etc. ➤ It also requires fencing of the property line and security arrangements.



(7)

(b) **Discuss the features of a construction project.**

(8)

- The project should have a specified target.
- The construction project should satisfy the owners requirement and expectations from the project.
- The construction project shall consist of a number of associated activities contributing to the project as a whole.
- The time limit for completion of project shall be defined.
- The Construction project is complex, and it involves several individuals from different departments. So, right coordination shall be setup within departments.
- The total cost of construction project shall be defined, and project shall be completed within the given budget.

- There are risks with each step of the project, and the project manager should manage those risks to reach the project goal.

UNIT – II

- V (a) **Explain the rules for taking measurements in M-book.** (8)

Measurement book is a record of works done and supplies made. Payment to the contractors and suppliers are made based on M.Book. • Measurement should be taken for finished item of work. • Measurements should be in the order of length, breadth, and height. • Length should be taken in meter, area in sq.m and volume in cu.m. o Measurements should be made in ink o Measurements should be neatly and directly entered to the M.Book at the site of worko Signature of the contractor should be obtained at the site of work at the time of measurement. o Measurements should be recorded continuously. Any page left blank should be cancelled by diagonal line and should be attested. o The person recording measurement shall put his signature with date

- (b) **Explain the merits and demerits of percentage rate contract and cost plus fixed fee contract.**

PERCENTAGE RATE CONTRACT

Advantages

- *The lowest rate and the position of contractor can be known by opening the tender*
- *Department fixes the rate for each item. Hence no chance of increasing the profit of contractor by high rates.*
- *Good quality work can be achieved*

Disadvantages

- *Sometimes the lower amount might not be sufficient for completing the work*
- *Contractors may not have proper knowledge about the work at the time of tender submission*

COST PLUS FIXED FEE CONTRACT

Advantages

- *The contractor performs the work with interest resulting in good quality of work*
- *The work can be taken in hand before the detailed drawings and specifications are made*
- *The work can be completed speedily*

Disadvantages

- *The final cost cannot be known before the completion of work*
- *This type of contract is not adopted in public works*
- *Contractor may use materials with high cost resulting in disputes between owner and contractor*

(7)

OR

VI (a) Explain the different modes of payment. (8)

FIRST AND FINAL PAYMENT- a single payment is made to the contractor or supplier after the completion of the work. This type of payment is provided for small works or supply materials. 2. INTERMEDIATE PAYMENT- intermediate payments are given to the contractor based on the contract agreement. intermediate payments are made in the different stages of work by the way of advances. 3. FINAL PAYMENT- final payment is given to the contractors within 3 months from the date of issue of certificate. it is also made in cases where the contract is terminated. if the work is not carried out according to the specification, executive engineer can terminate the contract.

(b) Explain the role of specification in construction activities. (7)

1. The specification provides clear instructions on project intent, performance, and construction.
2. It can reference the quality and standards which should be applied.
3. Materials and manufacturers' products can be clearly defined.
4. Installation, testing and handover requirements can be identified.

5. Classification within the specification can be used to support handover and asset management.
6. It eliminates the need for information overload on the drawing or model, making identifying information easier.
7. A specification can support project costing, not only the materials and products but the performance and workmanship.
8. Along with the drawings, the specification forms part of the contractual documents, helping minimise project risk and providing support should there be any legal disputes.

UNIT- III

VII (a) **Explain the different stages of HR procurement.** (9)

Vacancy arises • Need to the position • Review job description, job specification and selection criteria • Advertise • Applications – • Selection committee • Short listing of applicants • Conducting interviews • Verifying credentials • Ranking applicants • Writing selection report • Offers of appointment and starting salaries

(b) **Explain the functions of store management.** (6)

- Store management is concerned with ensuring that all the activities involved in storekeeping and stock control are carried out efficiently and economically by the store personnel.
- Efficient inventory management of the project implies availability of the right amount of stock at the right place at the right time.
- It also eliminates the rush and emergency of purchase which would otherwise add unnecessary expenses to the project.

OR

VIII (a) **Explain the factors related to selection of equipment.** (8)

- Whether to procure new or old equipment
- Operating expenses
- Out turn
- Contract time and project time
- Field operating conditions
- Weather
- Equipment must be selected to do the work in required time at the lowest cost.

(b) **Discuss the various labour welfare measures.** (7)

WORKMEN COMPENSATION ACT

An Act to provide for the payment by certain classes of employers to their workmen of compensation for injury by accident. It was introduced in 1923. It aims to provide workmen/their dependents some relief in

case of accidents. • However, the employer is not required to pay the compensation if the injuries are due to: ✓ Negligence on the part of a worker by willful disobedience of safety and security regulations ✓ Influence of drugs or diseases which are not caused because of job. **AMOUNT OF COMPENSATION** • In case of death due to injuries, the amount of compensation is 50% of the monthly wages of the workman multiplied by a relevant factor Or Rs 50000 whichever is more. • In case of total disablement due to injuries, the amount of compensation is 60% of the monthly wages of the workman multiplied by a relevant factor OR Rs 60000 whichever is more

TRADE UNION

To provide adequate wages, secure better conditions of work and employment, get better treatment from employers. • To protect labors against injustice • Promoting welfare measures such as health plans, life insurance bonus, provident fund etc • To provide legal assistance to workers whenever necessary • To improve sincerity and discipline among the workers • To provide opportunity for promotion and growth. • To protect women workers against discrimination

UNIT - IV

IX (a) What are the safety practices that are to be followed during:

(i) Excavation work. (ii) Demolition.

(8)

1) Excavation work

- Side of trenches should be supported by batters held in position by cross members.
- Use gangways provided for crossing excavations.
- Always keep gangways clear and free from rubbish.
- Do not stand on struts.
- Always use ladders to get into and out of excavations.
- Employ a registered professional engineer to design a protective system for trenches 20 feet deep or greater.
- Always wear your hard hat when working in an excavation

2) DEMOLITION WORK

- Utilities like sewage, water, electricity, or gas supply must be closed or diverted.
- Protective screens should be provided for all moving machineries.
- Trenches must be shored depending on the type of soil and depth of cutting.
- Ropes & wires should be of good quality.
- Hoisting & signaling should be done by qualified persons.
- Proper training should be provided to laborers on safety aspects.

(b) Explain any seven elements of TQM.

(7)

Customer satisfaction • Employee's involvement • Morale of employees • Quality control • Make higher profit • Lower cost • Quality planning • Quality improvement.

OR

X (a) Discuss the role of entrepreneurs. (8)

- Employment generation
- Mobilization of resources
- Regional disbursement of industries
- Provide opportunities for development of technology.
- Promotes exports.
- Support the growth of large industries.
- Better industrial relations

(b) Discuss the merits and demerits of ISO 9000 standards. (7)

MERITS

- Increased marketability
- Reduced operational expenses.
- Better management control
- Increased customer satisfaction
- Improved internal communication.
- Improved customer service
- Attractiveness to investors

DEMERITS

- It is not written for any specific industry.
- Achieving ISO 9000 certification is a costly process, especially for small firms.
- Heavy emphasis on documentation
- Lengthy process
- These standards are applicable for specific requirements of a product and are stated in terms of an established design or specification.