Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Sem: Odd Sem 2019-20
Course Code: CIV 404
Course Name: Construction Project Management
Program & Sem: B.Tech (CIV) VII & OE

Date: 30.09.2019
Time: 1.00PM to 2.00PM
Max Marks: 40
Weightage: 20%

Instructions:

(i) All the questions are compulsory
(ii) Scientific calculators are allowed

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries four marks. (3Qx4M=12M)

1. Define project. What are the unique features of a construction project?

(C.O.NO.1)[Knowledge]

2. What are the principles based on which organization structure is built?

(C.O.NO.1)[Knowledge]

3. Explain what are the factors considered to identify competent project manager which are critical to manage projects.

(C.O.NO.1)[Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries six marks. (3Qx6M=18M)

4. Matrix organization is an organizational structure that assigns specialists from different functional departments to work on one or more projects. List what are the advantages and disadvantages of this organization structure.

(C.O.NO.1)[Comprehension]

5. Functional managers are usually specialists, analytically oriented and they know the details of each operation for which they are responsible. How are project managers different from functional managers and explain what are their responsibilities towards the parent company?

(C.O.NO.1)[Comprehension]

6. Explain the roles and responsibilities of all the stakeholders in a construction project.

(C.O.NO.1)[Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The Question carries ten marks. (1Qx10M=10M)

7. Briefly explain about phases of a construction project.

(C.O.NO:1)[Knowledge]

SCHOOL OF ENGINEERING

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

Semester: VII

Course Code: CIV 404

Course Name: Construction Project Management

Date: 30-09-2019

Time: 1 Hour

Max Marks: 40

Weightage: 20%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels	Thought provoking type [Marks allotted] Bloom's Levels	Problem Solving type [Marks allotted]	Total Marks
			K	C	A	
1	CO 1	1	4			4
2	CO 1	1	4			4
3	CO 1	1	4			4
4	CO 1	1		6		6
5	CO 1	1		6		6
6	CO 1	1		6		6
7	CO 1	1	10			10
	Total Marks		22	18	00	40

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

[I hereby certify that All the questions are set as per the above guide lines. Ms. Navaneetha H]

Reviewers' Comments

Annexure- II: Format of Answer Scheme

SCHOOL OF ENGINEERING

SOLUTION

Semester: VII semester

Course Code: CIV 404

Course Name: Construction Project Management

Date: 30-09-2019

Time: 1:00 p.m

Max Marks: 40

Weightage: 20%

Part A (3Q x 4M = 12Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1.	**Definition:** The Guide to the Project Management Body of Knowledge (PMBOK) published by Project Management Institute (PMI)defines project as a temporary endeavor undertaken to provide a unique product or service. **Unique features of a construction project:** 1. One-time activity : it must be performed correctly the first time every time 2. Complexity: It is multi-disciplinary because it involves a set of interrelated tasks to be done by specialists 3. High cost and time for execution 4. High risk of failure 5. Difficulty in defining quality standards 6. Uniqueness of people relationship 7. Feedback mechanism 8. Lack of experience of client or owner 9. Untrained workforce	**Definition: 1 marks** **Unique features: 3 marks (any 6 points to be written)**	**5 mins**
2.	1. Principle of unity of objectives 2. Principle of division of work and specialization 3. Principle of span of control 4. Principle of scalar chain 5. Principle of unity of command 6. Principle of authority and responsibility 7. Principle of flexibility 8. Principle of balance 9. Principle of efficiency	**Any 8 points : 4 marks**	**5 mins**

	10. Principle of coordination		
3.	A number of demands are critical to the management of projects: 1. Acquiring sufficient resources 2. Acquiring and inspiring personnel 3. Finding sources of internal motivation 4. Dealing with obstacles 5. Making project goal trade offs 6. Dealing with risk and failure (perceived or otherwise) 7. Maintaining multiple channels of communication 8. Negotiation	**Any 4 points: 4 marks**	**5 mins**

Part B (3Q x 6M = 18Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
4	**ADVANTAGES** ▪ Relief to line of executives ▪ Expert advice /Benefit of Specialization ▪ Better co-ordination ▪ Benefits of Research and Development ▪ Training ▪ Balanced decisions ▪ Unity of action **DISADVANTAGES** ▪ Lack of understanding ▪ Lack of sound advice ▪ Line and staff conflicts ▪ Costly ▪ Assumption of authority ▪ Staff steals the show	Advantages: 3 marks Disadvantages: 3 marks	8 mins
5.	**The Functional Manager** • Analytical Approach • Direct, technical supervisor **The Project Manager** • Systems Approach • Facilitator and generalist **Responsibilities towards the Parent Organization:** ▫ Conservation of resources ▫ Timely and accurate project communications ▫ Careful, competent management of the project ▫ Protect the firm from high risk ▫ Accurate reporting of project status with regard to budget and schedule	Difference: 3 marks Responsibilities: 3 marks	8 mins

6.	**Architect:** ▪ They are responsible for pre-construction and construction phase ▪ They act on client's behalf ▪ Pre project phase duties of an architect: Preparation of drawings, preparation of tender document and contractor selection ▪ Construction phase duties of an architect: Checking the measurements and checking of bills and overall project management functions **Client (Owner)** ▪ They are the person or organization that will manage the facility or structure upon completion of the project ▪ Examples: national and local governments, public corporations, public enterprises, the army, stock companies, cooperative societies, enterprise groups, legal entities and individuals **Contractor** ▪ Completing the project on schedule to the contract concluded with the client in accordance with drawings and specifications ▪ Could be individual or big firms that go about business by taking on large scale projects involving many subcontractors and specialized subcontractors ▪ Contractors are generally profit making firms, their aim is to obtain as much contracted money from client at the earliest possible time and pay sub contractors as little as possible for what they do at latest possible time. **Engineer / Consultant** ▪ Works with client to conclude the contract ▪ Provides technical services on behalf of the client ▪ Consultants: Construction management consultants, Construction supervision consultant Project Management Consultant **Subcontractor/ Supplier/ Vendor** ▪ No single contacting company has adequate expertise or resources to be able to undertake all the activities on their own. Under such situation, they employ small contractors for certain specialized items of work for either execution purpose or material procurement purpose. **Lawyer, Insurer etc.** ▪ Play a minor role in construction projects ▪ Specialized in claims settlements and disputes	Listing of all stakeholders : 2 marks All roles and responsibilities: 4 marks	8 mins

Part C (1Q x 10M = 10Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
7	**Phases of construction project:** I. Pre-Project Phase II. Project Phase III. Post- Project Phase **Pre-Project Phase** a) Initiation or idea phase b) Project concept phase c) Feasibility Phase • Conceptual • Project Strategy • Estimate • Approval **Project phase** d) Basic Design Phase e) Detailed design phase f) Tendering Phase g) Execution Phase h) Closure Phase **Post- Project phase** a) Utilization Phase b) Close-Down Phase	Pre-Project phase: 3 marks Project phase: 4 marks Post Project phase: 3 marks	10 mins

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GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST – 2

Sem & AY: Odd Sem 2019-20
Course Code: CIV 404
Course Name: CONSTRUCTION PROJECT MANAGEMENT
Program & Sem: B Tech & VII (OE)

Date: 18.11.2019
Time: 1.00 PM to 2.00 PM
Max Marks: 40
Weightage: 20%

Instructions:
(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.

Part A [Memory Recall Questions]

Answer all Questions. Each question carries five marks. (4Qx5M=20M)

1. Describe general conditions of contract and bill of quantities. [5](CO1) [Knowledge]
2. What is lumpsum contract? What are its advantages [5](CO1) [Knowledge]
3. Describe work breakdown structure with an example? [5](CO2) [Application]
4. List the rules for drawing network diagram [5](CO2) [Application]

Part B [Thought Provoking Questions]

Answer the Question. The question carry ten marks. (1Qx10M=10M)

5. A company is involved in the production of M – sand for a particular construction site. The entire project is divided into eight activities. Answer the following questions with the help of the table given below.

Activity	Immediate	Duration of
A	-	2
B	-	3
C	B	1
D	A,C	4
E	C	3
F	C	2
G	D,E,F	5

I. Draw the network diagram for all the activities and their immediate predecessors. [4]

II. Draw the Gantt chart for the above network and find the total duration for the completion of the project. [6]

(CO2) [Application]

Part C [Problem Solving Questions]

Answer the Question. The question carry ten marks. (1Qx10M=10M)

6. Draw the network diagram for the following activities and identify the critical activities, non-critical activities and the critical path. Also find the project duration.

(CO2) [Application]

Activity	Immediate	Duration of
A	-	2
B	A	1
C	A	3
D	B,C	2
E	C	4
F	D,E	2
G	F	3
H	F	1
I	G,H	2

SCHOOL OF ENGINEERING

Semester: VII

Course Code: CIV 404

Course Name: Construction Project Management

Branch & Sem: B Tech – Civil Engineering, VII

Date: 18-11-2019

Time: 1 hour

Max Marks: 40

Weightage: 20%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K	C	A	K	C	A	K	C	A	
1	1	Module 1	5									
2	1	Module 1	5									
3	2	Module 2			5							
4	2	Module 2			5							
5	2	Module 2						10				
6	2	Module 2									10	
	Total Marks		10		10			10			10	40

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

Annexure- II: Format of Answer Scheme

SCHOOL OF ENGINEERING

SOLUTION

Semester: VII
Course Code: CIV 404
Course Name : Construction Project Management
Branch & Sem: B Tech – Civil Engineering, VII

Date: 30-09-2019
Time: 1 hour
Max Marks: 40
Weightage: 20%

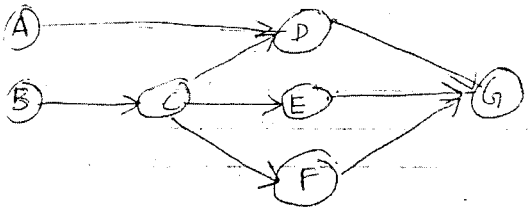
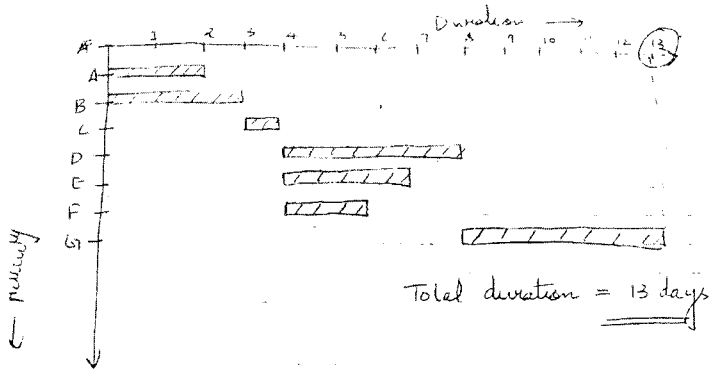
Part A (4Q x 5M = 20Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	General conditions of contract ➨ Standard forms are prepared jointly by professional bodies and organizations representing contractors or by large organizations and public bodies to suit their own circumstances. ➨ Different owners such as CPWD, MES, IOCL have evolved standard forms of general conditions ➨ There is growing trend of use of FIDIC contract conditions in large projects especially those funded by World Bank, Asian Development Bank. Bill of quantities ➨ The bill of quantities shows the net quantity to be executed in each item of work. ➨ BOQ shall be read and construed in conjunction with other Contract Documents. ➨ General directions and description of work and material given in the Technical Specification are not necessarily repeated in the Bill of Quantities. ➨ The Technical Specification forms an integral part of the Bill of Quantities.	2.5 2.5	8 min
2	• Involves a total fixed priced for all construction related activities.	3 marks (1 mark for each point)	8 min

	• Can include incentives or benefits for early termination, or can also have penalties, called liquidated damages, for a late termination. • Preferred when a clear scope and a defined schedule has been reviewed and agreed upon. Advantages • Low risk on the owner, Higher risk to the contractor • Cost known at outset • Contractor will assign best personnel • Contractor selection is easy.	2 marks (0.5 marks for each point)	
3	The WBS is described as a hierarchical structure which is designed to logically subdivide all the work-elements of the project into a graphical presentation. The full scope of work for the project is placed at the top of the diagram, and then sub-divided smaller elements of work at each lower level of the breakdown. At the lowest level of the WBS the elements of work is called a work package. A list of project's activities is developed from the work packages. Any example	2.5 marks 2.5 marks	8 min
4	Rule 1: Each activity is represented by one and only one arrow in the network. Rule 2: No two activities can be identified by the same end events Rule 3: Precedence relationships among all activities must always be maintained. Rule 4: Dummy activities can be used to maintain precedence relationships only when actually required. Their use should be minimized in the network diagram Rule 5: Looping among the activities must be avoided	1 mark for each rule(5 marks)	8 min

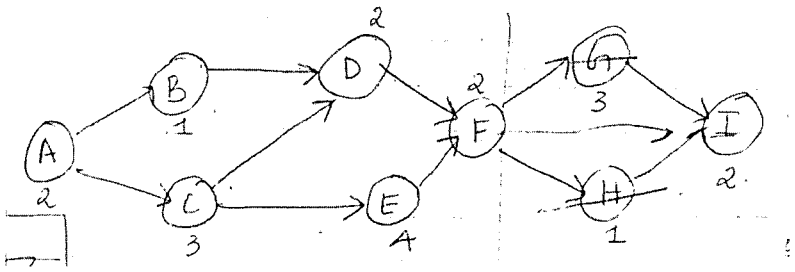
Part B

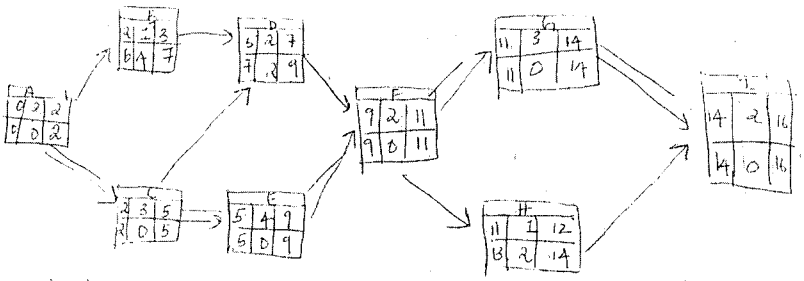
(1Q x 10M = 10Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
5	 	4 marks 6 marks	16 min

Part C

(1Q x 10M =10Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
6		2 marks for drawing network diagram 2 marks each for identifying critical	20 min



Critical path - A - C - E - F - G - I

Critical activities - A, C, E, F, G, I

Non critical activities - B, D, H

Project duration = 16 days

and non-critical activity and critical path

2 marks for project duration

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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Semester: Odd Semester: 2019 - 20 | **Date**: 26 December 2019

Course Code: CIV 404 | **Time**: 9:30 AM to 12:30 PM

Course Name: CONSTRUCTION PROJECT MANAGEMENT | **Max Marks**: 80

Program & Sem: B.Tech (All programs) & VII (OE-II) | **Weightage**: 40%

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) Scientific non-programmable calculators are permitted

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries 5 marks. **(4Qx5M=20M)**

1. What are the common mechanisms for resolving construction dispute?

(C.O.No.3) [Knowledge]

2. List all the rules used in construction of project network.

(C.O.No.2) [Knowledge]

3. Briefly explain about advantages and disadvantages of line-staff organization structure in a construction company.

(C.O.No.1) [Knowledge]

4. Develop project network for the following activity relationships:

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Predecessor	-	A	A	C	C	C	D,E,F	G	H	H	I,J	K	L	L	B,M,N

(C.O.No.2) [Comprehension]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries 10 marks. **(4Qx10M=40M)**

5. Budgeted cost of a construction project is estimated at Rs.900000/-. The project is planned to be completed in 9 months. The project is tracked after a month, 10% of the project is completed at a total expense of Rs.100000/-. The planned completion of work should have been 15%. Interpret the performance of project by earn value analysis.

(C.O.No.2) [Comprehension]

6. A Gantt chart is one of the most popular and useful ways of showing activities (tasks or events) displayed against time. Using Gantt chart determine the duration of the project for the following with help of project network:

Activity	A	B	C	D	E	F	G	H
Predecessor	-	A	A	B,C	C	D	E,F	F,G
Duration	2	3	3	2	1	2	3	4

(C.O.No.2) [Comprehension]

7. Total quality management has been trending management approach in construction industry used in enhancing performance in the project planning and delivery processes. TQM can be summarized as a management system for a customer-focused organization that involves all employees in continual improvement. What are the basic elements of *quality* which can be implemented in construction industry?

(C.O.No.3) [Knowledge]

8. CPM and PERT are techniques used for scheduling and controlling projects. Mention differences between these two techniques. Identify the critical path in the following network using critical path method:

Activity	A	B	C	D	E	F	G	H
Predecessor	-	A	A	B,C	D	D,E	E,F	G
Duration	2	3	4	5	1	2	4	5

(C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The Question carries 20 marks **(1Qx20M=20M)**

9. From the below table, find the minimum possible time of the project and cost associated with this project.

Activity	**Predecessor**	**Normal time**	**Crash time**	**Normal Cost**	**Crash cost**
A	-	2	1	10000	15000
B	A	8	5	15000	21000
C	A	4	3	20000	24000
D	B	1	1	7000	7000
E	B	2	1	8000	15000
F	C,D	5	3	10000	16000
G	E	6	2	12000	36000
H	F,G	4	3	10000	12000

(C.O.No.2) [Application]

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO (% age of CO)	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels	Thought provoking type [Marks allotted] Bloom's Levels	Problem Solving type [Marks allotted]	Total Marks
			K	C	A	
1	CO3	Unit 3	5			5
2	CO2	Unit 2	5			5
3	CO1	Unit 1	5			5
4	CO2	Unit 2		5		5
5	CO2	Unit 2		10		10
6	CO2	Unit 2		10		10
7	CO3	Unit 3	10			10
8	CO2	Unit 2		10		10
9	CO2	Unit 2			20	20
	Total Marks		25	35	20	**80**

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

I hereby certify that all the questions are set as per the above guidelines.

Faculty Signature: HBC BN
13.12.19

Reviewer Commend:

Format of Answer Scheme

SCHOOL OF ENGINEERING

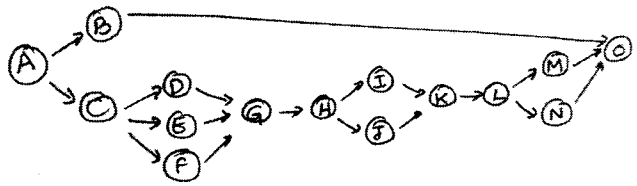
SOLUTION

Semester : Odd Semester: 2019 - 20
Course Code: CIV 404
Course Name: CONSTRUCTION PROJECT MANAGEMENT
Program & Sem: B.Tech (All programs), VII sem (OE-II)

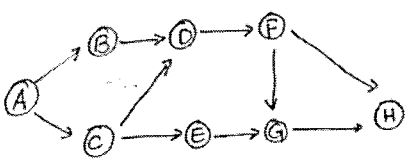
Date: 26 December 2019
Time: 9:30 A.M to 12:30 P.M
Max Marks: 100
Weightage: 50 %

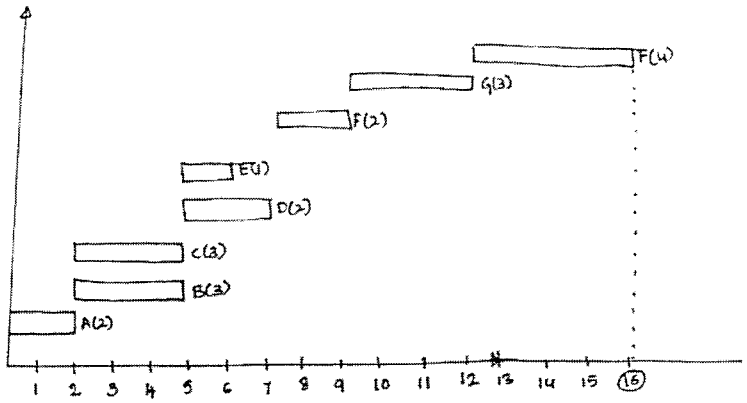
Part A (4Q x 5M = 20Marks)

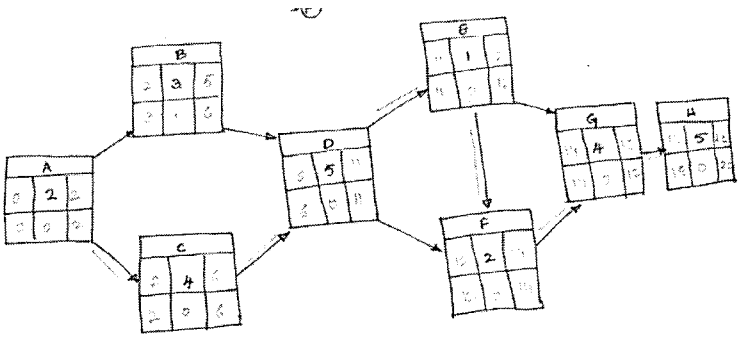
Q No	Solution	Scheme of Marking	Max. Time required for each Question
1.	**Non Binding Dispute Resolution Mechanisms** • Mediation • Early Neutral Evaluation **Temporarily Binding Dispute Resolution Mechanisms** • Statutory Adjudication • Dispute Boards • Expert Determination **Binding Dispute Resolution Forms** • Arbitration • Court Litigation	Non Binding Dispute Resolution Mechanisms- 2 marks Temporarily Binding Dispute Resolution Mechanisms- 2 marks Binding Dispute Resolution Forms- 1 mark	10 mins
2.	Rule 1: Each activity is represented by one and only one arrow in the network. Rule 2: No two activities can be identified by the same end events Rule 3: Precedence relationships among all activities must always be maintained. Rule 4: Dummy activities can be used to maintain precedence relationships only when actually required. Their use should be minimized in the network diagram Rule 5: Looping among the activities must be avoided	5 rules- 5 marks	10 mins
3	Line-staff organization ADVANTAGES ▪ In the line and staff structure, line employees are responsible for execution while staff employees play the advisory role ▪ Offers ample opportunity for growth of employees	Advantages (any 3 points)- 2.5 marks Disadvantages (any 3 points)-2.5 marks	10 mins

	▪ The quality of decisions arrived at in a problem situation is high DISADVANTAGES ▪ There is a lack of well-defined authority structure ▪ Structure is mostly suitable for large organization ▪ Where there is constant need for employing people with specialized skills ▪ Possibility of conflicts due to lack of authority ▪ Distinction between line function and staff function is difficult to make.		
4.		Correct project network- 5 marks If there is any discrepancy in the network appropriate marks can be deducted. If only one relationship is mismatched 1 mark can be deducted.	10 mins

Part B (4Q x 10M = 40 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
5	5th Ans PV : 15% × ₹ 9,00,000/- = ₹ 1,35,000/- EV : 10% × ₹ 9,00,000/- = ₹ 90,000/- AC : ₹ 1,00,000/- Data extracted from problem (2 marks) Cost metrics 3 marks (i) CV = EV - AC = 90,000 - 1,00,000 = -10,000 → -ve (ii) CPI = EV/AC = 90,000/1,00,000 = 0.9 → less than one CV is -ve, CPI is less than one, indicating project is overbudget Schedule metrics 3 marks (i) SV = EV - PV = 90,000 - 1,35,000 = -45,000/- → -ve (ii) SPI = EV/PV = 90000/135000 = 0.66 → less than one. SV is -ve, SPI is less than one, indicating behind schedule	Data – 2 marks Cost Metrics- 3 marks Schedule Metrics – 3 marks Interpretation: 2 marks	15 minutes
6	6th Ans Activity A B C D E F G H Predecessor - A A B,C C D E,F F,G Duration 2 3 3 2 1 2 3 4  	Project network: 4 marks Gantt chart:6 marks	15 minutes

	 Project Duration= 16 days		
7.	The basic element of quality in construction is: ▶ Quality characteristics ▶ Quality of design ▶ Quality of conformance Quality characteristics: Quality characteristics is related to the parameters with respect to which quality – control processes are judged. Quality characteristic includes strength, colors, texture, dimension, height etc. Example in compressive strength of concrete, usability of concrete in slump , etc. Quality of design:- It refers to the quality with which the design is carried out. It primarily related to meeting the requirement of the standard, functionally efficient system and economical maintainable system. Quality of conformance:- It is referred to the degree to which the constructed facility conformed the design and specification.	Just naming 3 elements: 1 marks Explanation: 3 marks each	15 minutes
8.	**Difference between CPM and PERT:** 1. PERT is event oriented whereas CPM is activity oriented. In simple words, in PERT network interest is focused upon start or completion of events and not on activities themselves. 2. In CPM network no allowance is made for uncertainties in the duration of time involved whereas in PERT network uncertainty is considered. 3. In PERT, time is not related to cost whereas in CPM the object is to develop an optimum time cost relationship. However, PERT has since been extended in this direction and the line dividing PERT/CPM is gradually fading out. 4. In CPM duration of activity is estimated with a fair degree of accuracy. In PERT duration of activities are not so accurate and definite	Difference- (any 3 points) – 3 marks	

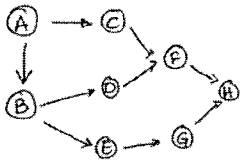
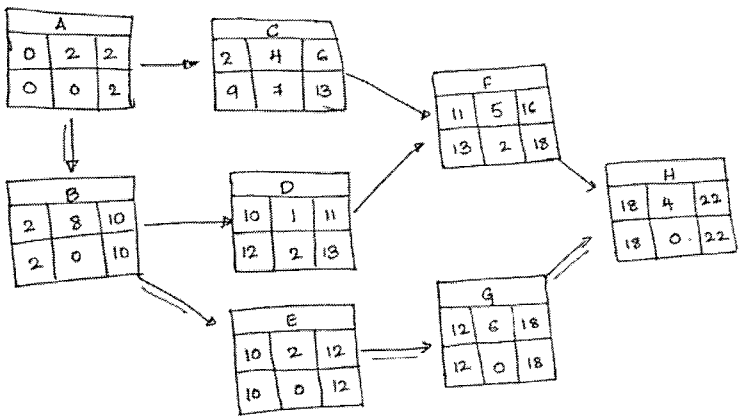


Critical path : A - C - D - E - F - G - H.

Project duration : 23 days

Non critical activities : (B).

Part C (1Q x 20M = 20Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
5	  Critical path : A - B - E - G - H. Non-critical activities : C, D, F Cost slope : $\frac{C_c - N_c}{N_t - C_t}$.	Network: 3 marks Identification: 3 marks Cost slope: 2 marks Each trial: 3 marks each	30 mins

Activity	Normal time	Crash time	Normal cost	Crash cost	Cost slope
x A	2	1	10,000 15,000	15,000	5000 x
x B	8 5	5	15,000 21,000	21,000	2000 x
C	4	3	20,000	24,000	1388.3
x D	1	1	7,000	7000	0000 x
E	2	1	8,000	15000	7000
F	5	3	10,000	16000	3000
G	6 4	2	12,000 24,000	36000	6000
x H	8 3	3	10,000 12,000	18000	2000 x

Various paths : A - C - F - H : 2+4+5+4 = 17

· A - B - D - F - H : 2+8+1+5+4 = 20

· A-B-E - G - H : 2+8+2+6+4 = 22

· Activity A, B, E, G, H can be crashed depending on minimum cost slope.

· B, H have cost slope of 2000. Anyone activity can be crashed.

Trial 1: Crashing activity B by 3 days.

A - C - F - H = 17

A - B - D - F - H = 20 17

A - B - E - G - H = 22 19

Activity B cannot be crashed anymore.

Trial 2: Crashing activity H by 1 day

A-C-F-H = 17 16

A-B-D-F-H = 19 16

A-B-E-G-H = 19 18

Activity H cannot be crashed anymore

Trial 3: A-B-E-G-H remains critical path, however.
B & H cannot be crashed anymore.

Out A, E, G least cost slope is 5000 for activity A

By crashing activity A by 1 day:

A-C-F-H = 16 15

A-B-D-F-H = 18 15

A-B-E-G-H = 18 17

Activity A can no longer be crashed

Trial 4 :- Activity A-B-E-G-H is critical path

But , A, B, H cannot be crashed anymore

Out E, G lowest slope cost slope is 6000 for activity G .

By crashing activity G by 2 days .

A-C-F-H : 15

A-B-D-F-H : 15

A-B-E-G-H : 13 15

Activity G can be further crashed however all three paths have become critical path. hence the min. crashed time : 15 days

Cost : Rs 1,19,000/-