18MED32

Hall Ticket Number:

IV/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION

November, 2022 — **Mechanical Engineering**

Seventh Semester — **Project Management**

Time: Three Hours — **Maximum:**50 Marks

Answer Question No.1 compulsorily. (10X1 = 10 Marks)

Answer ONE question from each unit. (4X10=40 Marks)

1.	a)	Define a Project? A Project is a temporary endeavor undertaken to create a unique product, service, or result.	CO1,L2	
	b)	What are the contents of a project plan? Objective, Program, Schedule, Budget, Forecast, Organization, Policy, Procedure Standard	CO1,L1	
	c)	What is network analysis used for? Network Analysis, Network Planning or Network Planning and Scheduling Techniques are used for planning, scheduling and controlling large and complex projects. These techniques are based on the representation of the project as a network of activities.	CO1,L3	
	d)	What is float and slack in project management? The difference between a job's early start and its late start (or between early finish and late finish) is called total slack (TS).	CO2,L2	
	e)	What is risk in project management? A risk is usually viewed as a hazard, something malign, which may adversely affect the project so that the achievement of the objective becomes more difficult, if not impossible, within the constraints of the project requirements.	CO2,L2	
	f)	State the main reason for reducing the project duration? The crashing of normal completion time of critical activities will increase the total cost of the project. But, the decision-maker will always look for trade-off between the total cost of project and the total time required to complete it.	CO2,L2	
	g)	List the Leadership styles in project management 1. Authoritarian Style or Autocratic Styles. 2. Democratic Style or Participative Styles. 3. Task Centred Style. 4. Employee Centred Style. 5. Benevolent Style. 6. Critical Style. 7. Self-Dispensing or Free-rein Style or Laissez-fair Style.	CO2,L3	
	h)	How critical path is determined in network analysis? Certain activities in any project are called critical activities because delay in their execution will cause further delay in the project completion time. All activities having zero total float value are identified as critical activities, i.e., L = E	CO3,L1	
	i)	What makes a good team in project management? Conduct Project Meetings Establish team Identity Create a shared vision Build a reward system Manage decision making Manage conflict Rejuvenate the project team	CO3,L2	
	j)	List the elements of a maturity model? Levels of Maturity and Knowledge areas	CO3,L2	

Unit -I

2.		What are the different phases of the project of project life cycle? Explain with diagram.	CO1,L2	10M

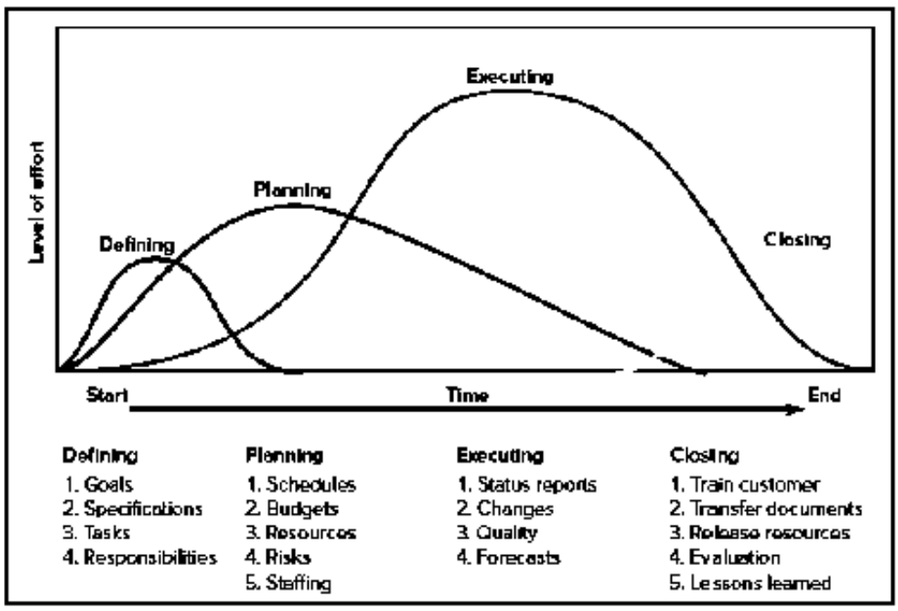
Defining stage. Specifications of the project are defined; project objectives are established; teams are formed; major responsibilities are assigned.

Planning stage. The level of effort increases, and plans are developed to determine what the project will entail, when it will be scheduled, whom it will benefit, what quality level should be maintained, and what the budget will be.

Executing stage. A major portion of the project work takes place—both physical and mental. The physical product is produced (e.g., a bridge, a report, a software program). Time, cost, and specification measures are used for control.

Closing stage. Closing includes three activities: delivering the project product to the customer, redeploying project resources, and conducting a post-project review.

In practice, the project life cycle is used by some project groups to depict the timing of major tasks over the life of the project.



(OR)

3. a) What are the six elements of a typical scope statement? CO1,L1 5M

The project scope statement is the description of the project scope, major deliverables, assumptions, and constraints.

The project scope statement documents the entire scope, including project and product scope. It describes the project's deliverables in detail. It also provides a common understanding of the project scope among project stakeholders. It may

contain explicit scope exclusions that can assist in managing stakeholder expectations. It enables the project team to perform more detailed planning, guides the project team's work during execution, and provides the baseline for

evaluating whether requests for changes or additional work are contained within or outside the project's boundaries.

The degree and level of detail to which the project scope statement defines the work that will be performed and the work that is excluded can help determine how well the project management team can control the overall project scope.

The detailed project scope statement, either directly or by reference to other documents, includes the following:

- Product scope description. Progressively elaborates the characteristics of the product, service, or result described in the project charter and requirements documentation.
- Deliverables. Any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project. Deliverables also include ancillary results, such as project management reports and documentation. These deliverables may be described at a summary level or in great detail.
- Acceptance criteria. A set of conditions that is required to be met before deliverables are accepted.
- Project exclusions. Identifies what is excluded from the project. Explicitly stating what is out of scope for the project helps manage stakeholders' expectations and can reduce scope creep.

b) Briefly discuss about Work break structure. CO1,L2 5M

In planning a project, the project manager must structure the work into small elements that are:

- Manageable, in that specific authority and responsibility can be assigned

Independent, or with minimum interfacing with and dependence on other ongoing elements

- Integratable so that the total package can be seen measurable in terms of progress

A work breakdown structure (WBS) is a product-oriented family tree subdivision of the hardware, services, and data required to produce the end product.

The WBS is structured in accordance with the way the work will be performed and reflects the way in which project costs and data will be summarized and eventually reported.

Preparation of the WBS also considers other areas that require structured data, such as scheduling, configuration management, contract funding, and technical performance parameters.

The WBS is the single most important element because it provides a common framework from which:

- The total program can be described as a summation of subdivided elements.
- Planning can be performed.
- Costs and budgets can be established.
- Time, cost, and performance can be tracked.
- Objectives can be linked to company resources in a logical manner.

- Schedules and status-reporting procedures can be established.
- Network construction and control planning can be initiated.
- The responsibility assignments for each element can be established.

The work breakdown structure acts as a vehicle for breaking the work down into smaller elements, thus providing a greater probability that every major and minor activity will be accounted for.

Although a variety of work breakdown structures exist, the most common is the six-level indented structure shown below:

	Level	*Description*
Managerial levels	1	Total program
	2	Project
	3	Task
Technical levels	4	Subtask
	5	Work package
	6	Level of effort

Unit -II

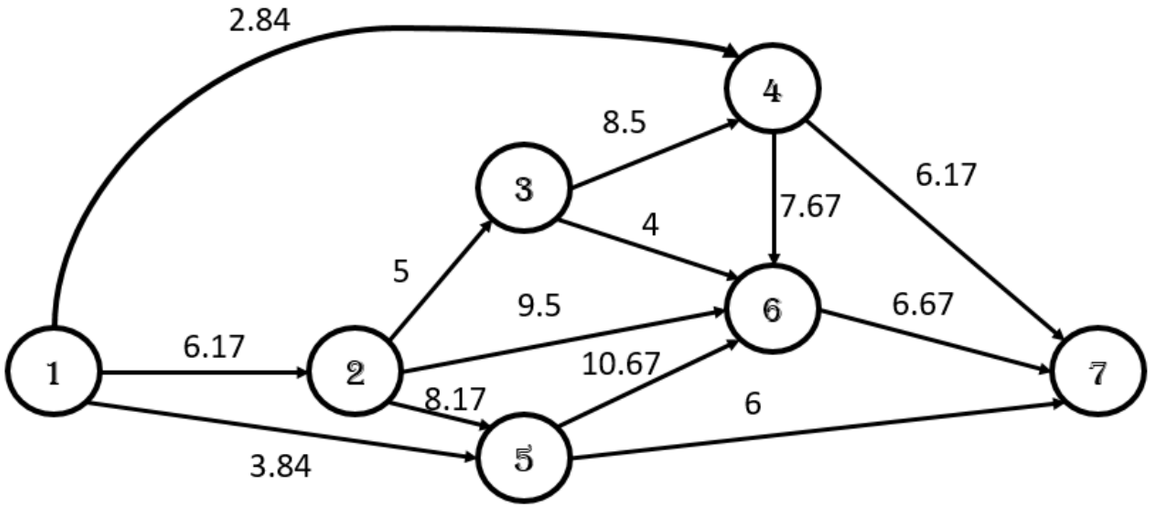
4. Consider a PERT project for which the following activities and the time estimates (optimistic, pessimistic and most likely times) have been obtained. Draw the network and determine the: CO2,L2 10M

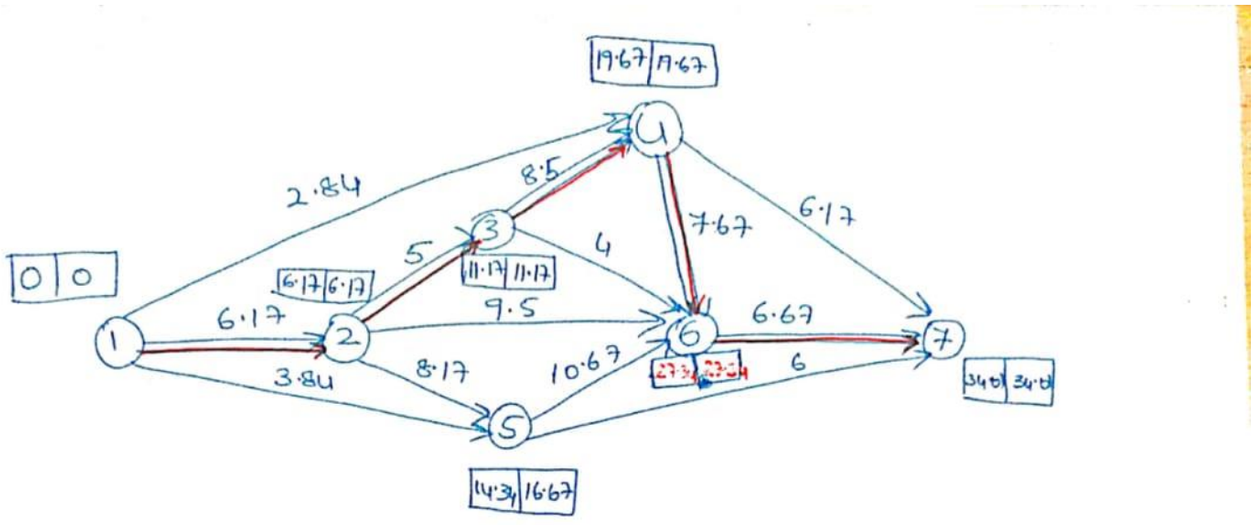
(i) Expected project duration, its variance and standard deviation.

(ii) Probability that the project is completed (a) as per schedule (b) 2 days earlier than expected.

Activity	(a ,b, m)
1,2	5,8,6
1,4	1,4,3
1,5	2,5,4
2,3	4,6,5
2,5	7,10,8
2,6	8,13,9
3,4	5,10,9
3,6	3,5,4
4,6	4,10,8
4,7	5,8,6
5,6	9,15,10
5,7	4,8,6
6,7	3,5,8

Activity	T_o	T_p	T_m	T_a	Variance
1,2	5	8	6	6.17	0.25
1,4	1	4	3	2.84	0.25
1,5	2	5	4	3.84	0.25
2,3	4	6	5	5	0.112
2,5	7	10	8	8.17	0.25
2,6	8	13	9	9.5	0.695
3,4	5	10	9	8.5	0.695
3,6	3	5	4	4	0.112
4,6	4	10	8	7.67	1
4,7	5	8	6	6.17	0.25
5,6	9	15	10	10.67	1
5,7	4	8	6	6	0.445
6,7	3	5	8	6.67	0.112





Critical Path ⇒ 1 – 2 – 3 – 4 – 6 – 7

Duration of the project = 34.01 days.

(ii) Probability of the project is completed in

(a) 34.01 days

$$z_0 = \left(\frac{T_t - T_e}{\sqrt{\sigma^2 \text{ critical path}}}\right)$$

$$= \frac{34.01 - 34.01}{\sqrt{2.169}}$$

$z_0 = 0$

$P(z = 0) = 0.5 \Rightarrow 50\%$

(b) 2days earlier. i.e, 32.01days.

$$z_0 = \left(\frac{T_t - T_e}{\sqrt{\sigma^2 \text{ critical path}}}\right)$$

$$= \frac{32.01 - 34.01}{\sqrt{2.169}}$$

$$= \frac{-2}{\sqrt{2.169}} = \frac{-2}{1.4727} = -1.358$$

$P(X \leq 32.01) = P(z \leq -1.358)$

$= 0.0885$

$= 8.85\%$

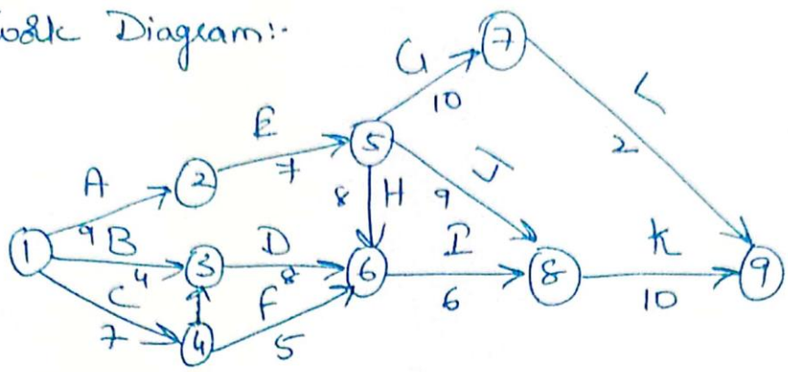
(OR)

5 Find a small project of 12 activities, the details of which are given below. Draw the network and find earliest occurrence time, latest occurrence time, critical activities and project completion time. 10M

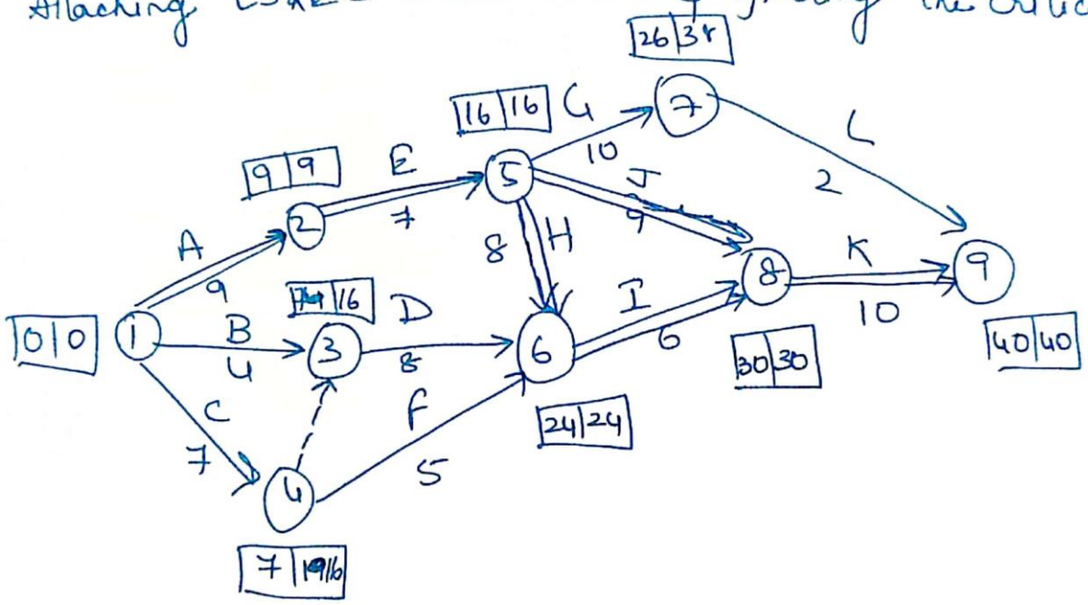
Activity	Dependence	Duration (Days)
A	--	9
B	--	4
C	--	7
D	B, C	8
E	A	7
F	C	5
G	E	10
H	E	8
I	D, F, H	6
J	E	9
K	I, J	10
L	G	2

Solution:

Network Diagram:-



Attaching LS&EC to the nodes & finding the critical path.



Critical Path = A → E → H → I → K

Unit -III

6. a) Why are accurate estimates critical to effective project management? CO3,L4 5M

Estimates are needed to support good decisions.
Estimates are needed to schedule work.
Estimates are needed to determine how long the project should take and its cost.
Estimates are needed to determine whether the project is worth doing.
Estimates are needed to develop cash flow needs.
Estimates are needed to determine how well the project is progressing.

b) What are the major types of costs? Which costs are controllable by the project manager? CO3,L2 5M

- Assuming work packages are defined, detailed cost estimates can be made. Here are typical kinds of costs found in a project:
- 1. Direct costs
  - Labor
  - Materials
  - Equipment
  - Other
- 2. Direct project overhead costs
- 3. General and administrative (G&A) overhead costs
- Direct Costs
  - These costs are clearly chargeable to a specific work package.
  - Direct costs can be influenced by the project manager, project team, and individuals implementing the work package.
  - These costs represent real cash outflows and must be paid as the project progresses; therefore, direct costs are usually separated from overhead costs.
- Direct Project Overhead Costs
  - Direct overhead rates more closely pinpoint which resources of the organization are being used in the project.
  - Direct project overhead costs can be tied to project deliverables or work packages.
  - Examples include the salary of the project manager and temporary rental space for the project team.
  - Although overhead is not an immediate out-of-pocket expense, it is real and must be covered in the long run if the firm is to remain viable.
- General and Administrative (G&A) Overhead Costs
  - These represent organization costs that are not directly linked to a specific project.
  - They are carried for the duration of the project.
  - Examples include organization costs across all products and projects such as advertising, accounting, and senior management above the project level.
  - Allocation of G&A costs varies from organization to organization.
  - However, G&A costs are usually allocated as a percent of total direct cost or a percent of the total of a specific direct cost such as labor, materials, or equipment.

(OR)

7. Describe measures for evaluating project performance with examples CO3,L3 10M

A project monitoring system involves determining what data to collect; how, when, and who will collect the data; analysis of the data; and reporting current progress.

Data collected are determined by which metrics will be used for project control.

Typical key data collected are actual activity duration times, resource usage and rates, and actual costs, which are compared against planned times, resources, and budgets.

- Collecting Data and Analysis
  - With the determination of what data are collected, the next step is to establish who, when, and how the data will be assembled.
    - Will the data be collected by the project team, contractor, independent cost engineers, project manager?
    - Or will the data be derived electronically from some form of surrogate data such as cash flow, machine hours, labor hours, or materials in place?
    - Should the reporting period be one hour, one day, one week, or what?
    - Is there a central repository for the data collected and is someone responsible for its dissemination?
  - Electronic means of collecting data have vastly improved data assembly, analysis, and dissemination.
  - Numerous software vendors have programs and tools to analyze customized collected data and present it in a form that facilitates monitoring the project, identifying sources of problems, and updating the plan.
- Reports and Reporting
  - Typically project progress reports are designed and communicated in written or oral form.
  - A common topic format for progress reports follows:
    - Progress since last report
    - Current status of project
      - 1. Schedule
      - 2. Cost
      - 3. Scope
    - Cumulative trends

- Problems and issues since last report
  - 1. Actions and resolution of earlier problems
  - 2. New variances and problems identified
- Corrective action planned

Unit -IV

8. Why is it important to assess the culture of an organization before deciding what project management structure should be used to complete a project? CO4,L2 10M

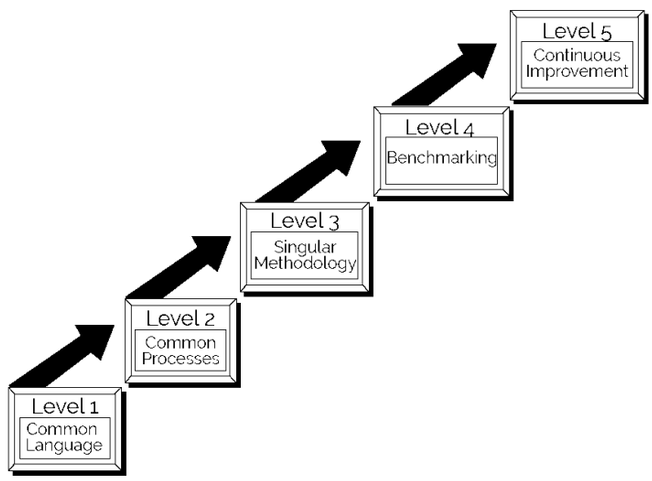
Once management approves a project, then the question becomes, how will the project be implemented?
A simple explanation of organizational culture is that it reflects the "personality" of an organization.
Just as each individual has a unique personality, so each organization has a unique culture.
Both the project management structure and the culture of the organization constitute major elements of the enterprise environment in which projects are implemented.
It is important for project managers and participants to know the "lay of the land" so that they can avoid obstacles and take advantage of pathways to complete their projects.
A project management system provides a framework for launching and implementing project activities within a parent organization.
A good system appropriately balances the needs of both the parent organization and the project by defining the interface between the project and parent organization in terms of authority, allocation of resources, and eventual integration of project outcomes into mainstream operations.

(OR)

9. Explain the Project Management Maturity model with neat sketch in detail. CO4,L21 10M

The foundation for achieving excellence in project management can best be described as the project management maturity model (PMMM), which is composed of five levels,

- Each of the five levels represents a different degree of maturity in project management.
- Level 1—Common Language: In this level, the organization recognizes the importance of project management and the need for a good understanding of the basic knowledge on project management, along with the accompanying language/terminology.
- Level 2—Common Processes: In this level, the organization recognizes that common processes need to be defined and developed such that successes on one project can be repeated on other projects. Also included in this level is the recognition that project management principles can be applied to and support other methodologies employed by the company.
- Level 3—Singular Methodology: In this level, the organization recognizes the synergistic effect of combining all corporate methodologies into a singular methodology, the center of which is project management. The synergistic effects also make process control easier with a single methodology than with multiple methodologies.
- Level 4—Benchmarking: This level contains the recognition that process improvement is necessary to maintain a competitive advantage. Benchmarking must be performed on a continuous basis. The company must decide whom to benchmark and what to benchmark.
- Level 5—Continuous Improvement: In this level, the organization evaluates the information obtained through benchmarking and must then decides whether or not this information will enhance the singular methodology.



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