1235

Code : 20PM01T

Register Number

II Semester Diploma Examination, June/July-2023

PROJECT MANAGEMENT SKILLS

Time : 3 Hours]   [Max. Marks : 100

Instructions :   (i)   Answer **one** full question from each Section-I, II, III, IV & V.

           (ii)   Each full question carries **20** marks.

           (iii)   Answer to be specific and to the point.

SECTION – I

1.   (a)   List any eight features of a project.   **8**

    (b)   Match the following consultancy firms with their services :   **6**

(i)	TATA Consultancy Services (TCS)	(a)	Manpower consultancy
(ii)	Tresvista Financial Services	(b)	Technical consultancy services
(iii)	WAPCOS Ltd.	(c)	IT solutions
(iv)	SIS Institute	(d)	Budget management
(v)	Kitco Ltd.	(e)	Water and power resources consultancy
(vi)	Talent Hunter	(f)	Entrepreneur training and consultancy

    (c)   Explain different types of project.   **6**

2.   (a)   Analyse the differences between Project and Operation.   **4**

    (b)   List any five characteristics of Project Manager.   **5**

    (c)   Discuss any three needs and any five main jobs of Project consultants.   **8**

    (d)   List any three obstacles in project management.   **3**

SECTION – II

3.   (a)   Define :

      (i)   Project Procedure Manual (PPM)   4

      (ii)   Project Execution Plan (PEP)

   (b)   Describe the prerequisites for successful project implementation.   6

   (c)   Develop a Work Breakdown Structure (WBS) for sports events of a college.   6

   (d)   Analyse the importance of communication in a project.   4

4.   (a)   List the different types of project teams and explain any two teams.   6

   (b)   List the steps to be taken for effective communication.   4

   (c)   Develop the factors to be considered while selecting the project team members.   5

   (d)   Analyse the steps involved in project direction.   5

SECTION – III

5.   (a)   List the different phases of project management life cycle.   4

   (b)   Discuss any three methods of risk analysis.   6

   (c)   The polytechnic industrial tour for students was planned for 15 days. However the tour took 18 days for completion. Evaluate the possible reasons for the delay in the planned tour.   5

   (d)   Explain best and worst case analysis. Mention its limitations.   5

6.   (a)   Define project risk. List different type of risk assessment techniques.   5

   (b)   Discuss the key project management steps for monitoring and controlling of a project.   5

   (c)   A house construction project was planned to implement with an estimated budget of 80 lacs. However after the completion of the project it was found that the project cost was 98 lacs. Evaluate the possible reasons for the increase in the cost of the project.   8

   (d)   Discuss political risk in project execution.   2

SECTION – IV

7. (a) State any four function of project planning.   **4**

    (b) Discuss the functions of project auditor (any six).   **6**

    (c) Draw the project planning structure.   **5**

    (d) Construct a Gantt chart for the given project.   **5**

Jobs	Start Day	Duration	Manpower
J-1	0	4	6
J-2	2	2	4
J-3	4	8	7
J-4	8	5	5
J-5	11	4	2

8. (a) List any five time monitoring efforts.   **5**

    (b) Describe project evaluation and mention any three reasons for conducting evaluation.   **5**

    (c) Construct a Network diagram for following details and show critical path :   **10**

Activity Letter	Preceding activities	Duration (in days)	No. of employees
A	Nil	0	–
B	A	8	3
C	B	2	5
D	B	1	2
E	C	1	3
F	B	3	7
G	D, F	1	2
H	B	6	5
I	E, H	3	3
J	G	2	4
K	J	1	3
L	I, K	1	3
M	L	1	2
N	M	1	2

[Turn over

SECTION – V

9.   (a)   List the different phases of project review.   5

       (b)   Discuss the differences between Augmented Reality (AR) and Virtual Reality (VR).   5

       (c)   Analyse the uses of network techniques (any five).   5

       (d)   Describe the steps involved in Data science and Data analytics in project management.   5

10.   (a)   Distinguish between PERT and CPM in project management.   5

       (b)   Discuss the applications of Internet of Things (IoT).   5

       (c)   List the benefits of AR and VR in project management.   5

       (d)   Analyse the steps in project audit program.   5

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PROJECT MANAGEMENT SKILLS (20PM01T)
<u>**Scheme of Valuation**</u>

Instructions:

1. Answer one full question from each SECTIONI, II, III, IV, and V.
2. Each One full question carries 20 marks.
3. Answer to be specific and to the point

Q. No.	Question breakup	Marks
	SECTION-I	
1(a)	Eight features	08×01=08
1(b)	Match the following.	06×01=06
1(c)	Three types Listing + explain (any one or more points each)	03+03=06
	OR	
2(a)	Any four differences.	04×01=04
2(b)	Any five qualities.	05×01=05
2(c)	Any three needs and Five jobs.	03+05=08
2(d)	Any three obstacles.	03×01=03
	SECTION-II	
3(a)	Definition. i) and ii)	02+02=04
3(b)	Listing and explanation	03+03=06
3(c)	WBS construction.	06
3(d)	Any four importance.	04×01=04
	OR	
4(a)	Listing and explanation of any TWO.	04+02=06
4(b)	Steps.	04×01=04
4(c)	Any five factors.	05×01=05
4(d)	Steps.	05
	SECTION-III	
5(a)	List four phases.	04×01=04
5(b)	Any Three methods	03×02=06
5(c)	FIVE reasons.	05×01=05
5(d)	Explanation and limitations	03+02 =05
	OR	
6(a)	Definition and listing	03+02 =05
6(b)	Five Steps	05
6(c)	Eight reasons.	08×01=08
6(d)	Definition.	02
	SECTION-IV	
7(a)	Any Four functions.	04×1=04
7(b)	Any Six functions.	06×1=06
7(c)	Block diagram	05
7(d)	Each correct job (FIVE JOBS)	05×01=05
	OR	
8(a)	Five efforts	05×01=05
8(b)	(i) Definition (02) (ii) List any three reasons (03×01=03).	02+03=05
8(c)	Construction and identifying critical path	09+01=10

	SECTION-V	
9(a)	Different phases	05×01=05
9(b)	Five differences.	05×01=05
9(c)	Five uses	05×01=05
9(d)	Steps	05
	OR	
10(a)	Any five differences between PERT and CPM.	05×01=05
10(b)	Five applications.	05×01=05
10(c)	Five benefits.	05×01=05
10(d)	Steps	05

Q.No.	Question and Answers	Marks
	SECTION-I	

1(a)	**List any Eight features of a project.**
	 Following are some important features of a project:
	   ➤ Unique in nature. (No two projects are exactly similar)
	   ➤ Have definite goals (objectives) to achieve
	   ➤ Require set of resources.
	   ➤ Have a specific time frame for completion with a definite start and finish.
	   ➤ Project has a life cycle reflected by start, growth, maturity and decline
	   ➤ Involves risk and uncertainty
	   ➤ Require cross-functional teams and interdisciplinary approach.
	   ➤ Change is an inherent feature in any project throughout its life.
		08

1(b)	**Match the following:** <table><tr><td>TATA Consultancy Services (TCS)</td><td>IT solutions and Services</td></tr><tr><td>Tresvista Financial services</td><td>Budget management</td></tr><tr><td>WAPCOS Ltd</td><td>Water and Power resources consultancy</td></tr><tr><td>SIS Institute</td><td>Entrepreneur training and consultancy</td></tr><tr><td>Kitco Ltd</td><td>Technical consultancy services</td></tr><tr><td>Talent Hunter</td><td>Manpower Consultancy</td></tr></table>	06

1(c)	**Explain different types of Project.**
	 1. Normal Projects
	   • Adequate time is allowed for implementation.
	   • All the phases in a project are allowed to take their normal time, as measured
	   • previously
	   • Minimum requirement of capital.
	   • No sacrifice in terms of quality.
	
	 2. Crash Projects
	   • Requires additional costs to gain time.
	   • Maximum overlapping of phases is encouraged.
	   • Simultaneous work by subcontracting is done here.
	
	 3. Disaster Projects
	   • These are projects are undertaken due to unexpected situation like: nature's calamities
	   • or floods etc. These provide rehabilitation for affected people.
	   • Anything needed to gain time is allowed in these projects.
	   • Round the clock work is done at the construction site.
	   • Capital cost will go up very high.
	   • Project time will get drastically reduced as it is of upmost importance.
		06

	OR	
2(a)	**Identify any four differences between project and operation.** Difference between project and operation are as follows:	04

Sl #	Project	Operation
1	Temporary	Repetitive
2	Unique	Continuous cycle
3	Create new product, service or process	Product, service or process already created and is in use
4	Performance, cost and time are uncertain	Performance, cost and time are known
5	Developing a new system	System already exists, maintaining and sustaining
6	Unexpected inputs and outputs	Expected inputs and outputs
7	More risk, usually done for the first time	Fewer risk as they are repeated many times
8	When objectives are achieved the project ends	Multiple objectives to be achieved again and again

2(b)	**List any FIVE qualities of Project manager.**	**05**

- Flexible and adaptable to certain circumstances
- Preference for significant initiative and to evolve as a best leader.
- Aggressiveness, confidence, persuasiveness, verbal fluency; ultra-specialist in communication, Ambition, activity, forcefulness.
- Effectiveness as integrator of project personnel.
- Broad scope of personal interests; must have a diverse interest.
- Composed with enthusiasm, in agitation, spontaneity.
- Able or willing to devote most of his time to planning and controlling.
- Able to identify problems ahead.
- Willing to make decisions that are acceptable to the team.
- Able to maintain a proper balance in the use of time.

2(c)	**Discuss any THREE needs and any FIVE main jobs of Project consultants.**	**08**

Need of Consultants
a. When a project with new technology is undertaken.
b. When the in-house consultant is incapable of meeting the requirement of the project.
c. When there is no in-house facility available in the organization.
d. When the project is executed on the basis of imported technology and knowhow.
e. To avail the advantages of expertise available with the outside consultants.

Main jobs of the consultants are:
i. Preparation of feasibility report
ii. Techno-economic report
iii. Preparation of detailed project report
iv. Detailed engineering and consultancy services
v. Detailed commercial capability
vi. Project monitoring and control
vii. Supervision of erection and commissioning of report.
viii. Provide pre and post commissioning services

2(d)	**List any THREE obstacles in Project management.**	**03**
	• Project complexities • Execution of customer's special requirement might result time delay and co-ordination with many agencies. • Organization rearrangement is a typical task. • Project risks, coupled with statutory changes are nightmare for the project manager. • Changes in technology needs highly qualified team. • Forward planning and pricing.	

<div align="center">

SECTION-II

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3(a)	**Procedure Manual (PPM) and Project Execution Plan (PEP).**	**04**

	Project Procedure Manual (PPM):
	➢ The project procedure manual gives a complete picture about the system.
	➢ It is intended to guide project managers.
	➢ It has to be prepared in such a way that the agencies are able to see their roles and mutual relationships in achieving the common goal.
	➢ Preparation of a project procedure manual should start with each project management sub system.
	➢ It contains the instruction for handling the project in accordance with the terms of the contract.
	
	Project Execution Plan (PEP):
	➢ The Project Execution Plan is the governing document that establishes the means to execute, monitor, and control projects.
	➢ It is a document that describes the objectives we want to achieve in a company with the time and resources needed along with the costs, quality, benefits, etc.
	➢ PEP includes four sub-plans. These are:
	    i. Contracting Plan
	    ii. Work packing Plan
	    iii. Organization Plan
	    iv. Systems and Procedure Plan	

3(b)	**Describe the prerequisites for successful project implementation.**	**06**
	1) Adequate Formulation: Often project formulation is deficient because of one or more of the following shortcomings. **2) Sound Project Organization:** A sound organization for implementing the project is critical to its success. 1. It is led by a competent leader who is accountable for the project performance. 2. The authority of the project leader and his team is corresponding with their responsibility. 3. Adequate attention is paid to the human side of the project. 4. Systems and methods are clearly defined. 5. Rewards and penalties to individuals are related to performance. **3) Proper Implementation Planning:** Once the investment decision is taken, and during the formulation and	

appraisal process, it is necessary to do the detailed implementation planning before commencing the actual implementation.

- Develop a comprehensive time plan for various activities.
- Estimate meticulously the resource requirements (manpower, materials, money, methods etc.) for each period to realize the time plan.
- Define properly the inter-linkages between various activities of the project.
- Specify cost standards.

4) Advance Action:

When the project appears to be operational, advance action on the following activities may be initiated.

- Acquisition of land,
- Securing essential clearances,
- Identifying technical consultants,
- Arranging for infrastructure facilities,
- Preliminary design and engineering,
- Calling of tenders.

5) Availability of Funds:

Once a project is approved, adequate funds must be made available to meet its requirements as per the plan of implementation.

6) Effective Monitoring:

To keep a track on the progress of the project, a system of monitoring must be established.

- Anticipating deviations from the implementation plan.
- Analysing emerging problems and resolving it at the earliest.
- Taking corrective action.

3(c)	**Develop a WBS for sports event of a college.**	**06**
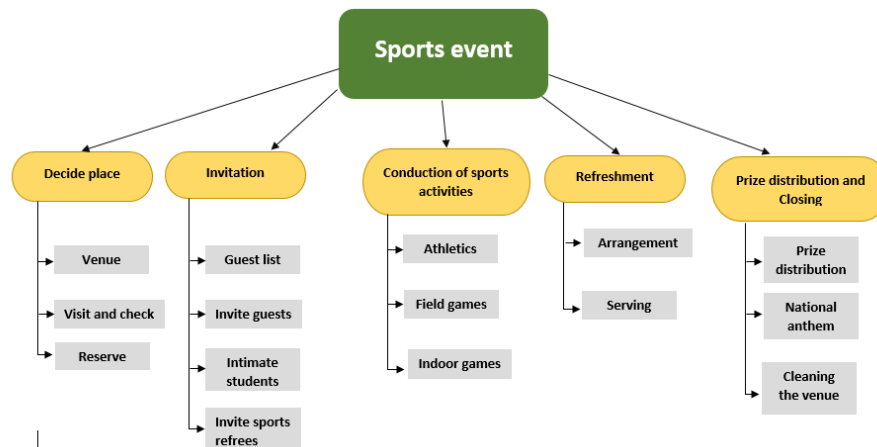
OR

Generalized work breakdown structure.

Generalized Work Breakdown Structure (WBS)

3(d)	**Analyse the importance of communication in a project.**	04
	➢ Effective communication is often the foundation of successful projects.	
	➢ Good communication can unite team members and stakeholders to a project's strategy, objectives and budget.	
	➢ It can also enable everyone involved in the project to understand his or her roles, which may make them more likely to support the project.	
	➢ Without effective communication, projects can incur more risk and fail to meet desired outcomes.	
	➢ According to Peter F Drucker, 63% of management problems are due to faulty communications.	
	➢ For a successful project implementation, a two-way communications system is essential.	
	For that matter, the entire process of direction, coordination and control in aproject revolves around communication.	

<div align="center">**OR**</div>

4(a)	**List the different types of project team and explain any two project team.**	06
	Project team can be classified as	

a) Initial project team
b) Designated project leader/manager
c) Core project team or project steering committee
d) Full project team
e) Project advisors
f) Project stakeholders
g) Process facilitators.

a) Initial project team
➢ It consists of specific people who have idea of starting a project.
➢ The member of this team may or may not be a part of the core project team.

b) Designated project leader/manager
➢ Any one of the team members will be designated as a project leader/manager and he will be responsible for coordinating the activities of team members, managing the relations with key stakeholders and the process of going through the project cycle.

c) Core project team
➢ It is a small group of people of 3 to 8 members who are ultimately responsible for designing and managing the project.
➢ It is also called the project driving committee consisting of sponsor, client, leader, expert/specialist and internal auditor (inspector or examiner).

d) Full Project Team
➢ It is bigger than the core project team, it consists of a complete group of people involved in designing, implementing, monitoring and learning from a project.
➢ This team includes managers, stakeholders, researchers and other key members of the project.

e) Project Advisors
➢ The project advisors are not the part of project team
➢ Team members can depend on advisors for honest feedback and counselling
➢ Project advisors can coordinate the works of the project

|		
	f) Project stakeholders ➤ The project stakeholders are individuals, groups or institutions who are interest in the project outcome ➤ They have a stake in the project ➤ The project success or failure depends on how much the stakeholders are satisfied with the project ➤ It is not mandatory that all the stakeholders should be a part of the projectteam. ➤ The key stakeholders will find a place in the project team. ➤ Example: Project manager, Team members, Managers, Resource managers,Executives, senior management, Company owners and Investors. **g) Project Facilitators** ➤ Project Facilitators help the project through the planning process. ➤ He is part of the initial project team and the core project team. ➤ He understands the key elements of the process and he has good facilitation skills. ➤ A facilitator is an unbiased person who listens to both sides of an argument. ➤ The facilitator will solve problems by reaching common ground between two or more people.	
4(b)	**List the Steps to be taken for effective communication:** 1. Make communication a priority 2. Don't assume you know everything 3. Keep things positive 4. Switch up the communication channels 5. Keep updates timely and concise	**04**
4(c)	**Develop the factors to be considered while selecting the project team members.** ➤ Knowledge about biodiversity and threat to biodiversity. ➤ Knowledge about political, social and economic context. ➤ Knowledge or experience of stakeholders and their concerns. ➤ Experience or skill in developing the strategies. ➤ Experience in communication. ➤ Experience in fundraising ➤ Experience in budgeting and risk assessment. ➤ Should understand the psychology of the team. ➤ Should not be short tempered.	**05**
4(d)	**Analyse the steps involved in Project direction.** 1. Staffing – Seeing that a professional person is chosen for every position. 2. Training – Training individuals and groups on how to fulfil their duties andresponsibilities. 3. Supervising – Giving day-to-day instructions, guidance and discipline asrequired so that they can fulfil their duties and responsibilities. 4. Delegating – Assigning work, responsibility, and authority so that others canmake maximum utilization of their abilities. 5. Motivating – Encouraging others to put more effort into the successfulcompletion of the projects. 6. Counselling – Solve the personal problems and holding private discussionsabout how he might do better work. **7.** Coordinating – Bring synchronization between different activities**.**	**05**

	SECTION-III	
5(a)	**List the four phases of Project Management Life cycle.** The four phases of project life cycle are, i. Initiation ii. Planning iii. Execution iv. Closure or Termination.	**04**
5(b)	**Discuss any THREE methods of risk analysis.** **Risk Analysis** **(a) Sensitivity Analysis:** Sensitivity Analysis is a method that measures how the impact of uncertainties of one or more input variables can affect the output. This analysis improves the prediction of the model, by improving the response of model to change in inputvariables. In sensitivity analysis, typically one variable is changed at a time. **(b)Scenario Analysis:** Scenario analysis is a process of analysing future events by considering alternative possible outcomes. Scenario analysis is conducted, to analyse the impacts of possible future events on the system performance. (b) **Best-case and Worst-Case Analysis:** The objective of best-case and worst-case scenario analysis is to get a feelof what happens under the most favorable or the most adverse configuration of key variables, without bothering much about the internal consistency of such configurations. **(d) Simulation Analysis:** The Simulation Analysis is a method, wherein the infinite calculations are made to obtain the possible outcomes and probabilities for any choice of action. The role of simulation analysis is to summarize and analyse the results, in a way that will yield maximum insight and help with decision-making.	**06**

5(c)	**The possible reasons for the given project time overruns**
	
	  ➢ A change in the scope of the planned trip.
	  ➢ Ineffective time management.
	  ➢ Delays in starting of the trip.
	  ➢ Delay in executing of the planned trip activities.
	  ➢ A delay in one place visit, results in delays in subsequent activities.
	  ➢ Use of defective vehicle for trip.
	  ➢ Due to natural and unavoidable circumstance (Rain, flood etc)
	  ➢ Improper management of boarding and lodging facility.
	  ➢ Unexpected accident of the vehicle.
	  ➢ Unexpected vehicle breakdown.
	  ➢ Poor administration.
	  ➢ Poor planning.
		05

5(d)	**Best-case and Worst-Case Analysis:**	**05**

The objective of best-case and worst-case scenario analysis is to get a feelof what happens under the most favorable or the most adverseconfiguration of key variables, without bothering much about the internal consistency of such configurations.

Best Scenario	High demand, high selling price, low variable cost, and so on.
Normal Scenario	Average demand, average selling price, average variable cost, and so on.
Worst Scenario	Low demand, low selling price, high variable cost, and so on.

Limitations:
1. It is based on assumptions that there are few described scenarios.
2. The assumptions are not true in most of the cases.
3. The demand in the market is based on the economy of the state which is very difficult to predict and the assumption model can fail.

OR

6(a)	**Define project risk. List different type of risk assessment techniques.**	**05**

Definition:
Risk is defined as the possibility of an outcome being different from the expected outcome. It refers to the possibility of adverse results flowing from the uncertainty involved in carrying out the activities.

Types of Risk Assessment Techniques.
1. Severity x frequency x number of people affected.
2. The Risk Assessment Matrix:

6(b)	**Key project management steps for monitoring and controlling a project:**	**05**

In this phase, the monitoring of the project life is done to ensure the project is going according to plan, and if it isn't, controlling it by working out solutions to get it back on track. In reality, a project manager is monitoring and controlling a project in some way throughout the phases.

1. **Cost & Time Management** – Review timesheets and expenses to record, control and track against the project's budget, timeline and tasks.
2. **Quality Management** – Reviewing deliverables and ensuring they meet the defined acceptance criteria.
3. **Risk Management** – Monitor, control, manage and reduce potential risks and issues.
4. **Acceptance Management** – Conduct user acceptance testing and create a reviewing system, ensuring that all deliverables meet the needs of the client.
5. **Change Management** – When the project doesn't go as per the plan, managing the process of acceptable changes with the client to ensure they're happy with necessary changes.

6(c)	**The possible reasons for the given project cost overruns:**
	  ➤ Unplanned expansion of the project scope.
	  ➤ Inaccurate initial cost estimation.
	  ➤ Failures in project performance.
	  ➤ Errors in project design.
	  ➤ Improper risk management.
	  ➤ Improper project team building.
	  ➤ Wrong choice of equipment.
	  ➤ Incompetent material suppliers.
	  ➤ Time overrun.
		08

6(d)	*Political Risks:* Nationalisation or privatisation of a particular industry, political instability, and trade restriction are some examples of political risks. The project manager should ensure that the project does not go against the political interests of the country.	02

SECTION-IV

7(a)	**State any FOUR functions of Project planning**
	Following are the functions of project planning:
	  ➤ It should provide a basis for organizing the work on the project.
	  ➤ It allocates the responsibilities to individuals.
	  ➤ It is a means of communication and coordination between all those involved in the project.
	  ➤ It induces the people to look ahead.
	  ➤ It gives a sense of urgency and time consciousness.
	  ➤ It establishes the basis for monitoring and controlling.
		04

7(b)	**Discuss the functions of Project auditor (any SIX)** 1. Plan and manage assigned audit projects according to established standards. 2. Oversee auditing for operational, financial and compliance areas. 3. Analyse root causes of control inefficiencies and recommend corrective actions. 4. Measure, confirm, investigate, and report the status of a project with a view of reducing the uncertainties. 5. Give advice to make recommendations. 6. Evaluate the contract base lines and give judgement on their adequacy. 7. To derive conclusions based on the audits conducted, maintain the documents related to the audit work.	06
7(c)	**Draw the project planning structure.** 	05

7(d)	**Construct the Gantt chart for the given project**	**05**

PROJECT DETAILS

JOBS	START DAY	DURATION	MANPOWER
J-1	0	4	6
J-2	2	2	4
J-3	4	8	7
J-4	8	5	5
J-5	11	4	2

Solution:
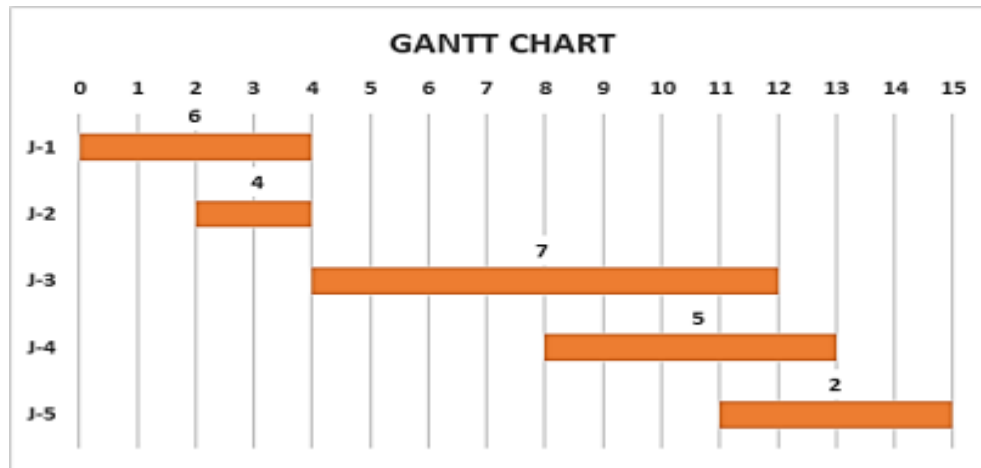
OR

8(a)	**List any FIVE Time Monitoring efforts.**	**05**

1. Development of project execution plan and overall project implementation schedule.
2. Preparation of special condition of contract for scheduling and monitoring.
3. Evaluation of bids in relation to scheduling and monitoring.
4. Review the detailed schedules and progress reports submitted by vendors and contractors.
5. Reviews with owner, consultants, contractors and vendors.
6. Project audit and corporate review.
7. Monthly progress report to the owners.
8. Installation and operation of an on-line information system.
9. On job training for on-going schedule and monitoring.

8(b)	**Define project evaluation and Reasons**	**05**

(i) Project evaluation: Project Evaluation is a step-by-step process of collecting, recording and organizing information about project results, including short-term and longer-term project outcomes

(ii) Reasons of project evaluation
Project evaluation provides answers to several aspects such as:
- Progress made.
- Effective and efficient use of resources.
- Desired output achieved.
- Improvements to be made for better outcome.
- Success factors
- Whether the results justify the input etc.

8(c)	Construct a Network diagram for following activities.				**10**

Activity Letter	Activity Description	Preceding Activities	Duration (days)	No. of Employees needed
A	Start	Nil	0	-
B	Design	A	8	3
C	Build frame	B	2	5
D	Build doors	B	1	2
E	Fix axles, wheels and fuel tank	C	1	3
F	Build body shell	B	3	7
G	Fit doors to body shell	D, F	1	2
H	Build and test engine	B	6	5
I	Assemble and test chassis	E, H	3	3
J	Paint body	G	2	4
K	Interior	J	1	3
L	Mount body to chassis	I, K	1	3
M	Road test the car	L	1	2
N	Finishing touch	M	1	2
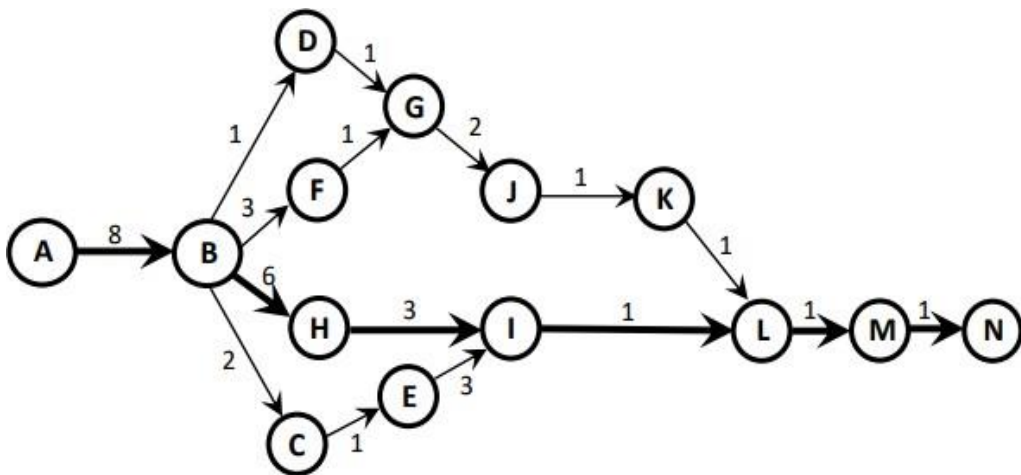
Path IV: A-B-C-E-I-L-M-N   8+2+1+3+1+1+1 = **17 days**
Path III: A-B-H-I-L-M-N   8+6+3+1+1+1 = **20 days**
Path II: A-B-F-G-J-K-L-M-N   8+3+1+2+1+1+1+1 = **18 days**
Path I: A-B-D-G-J-K-L-M-N   8+1+1+2+1+1+1+1 = **16 days**

The longest path is**: A-B-H-I-L-M-N which takes 20 days.** This path is called the critical path. The network diagram represents the critical path by thick arrows to indicate the critical path.

OR

DUMMY ACTIVITY
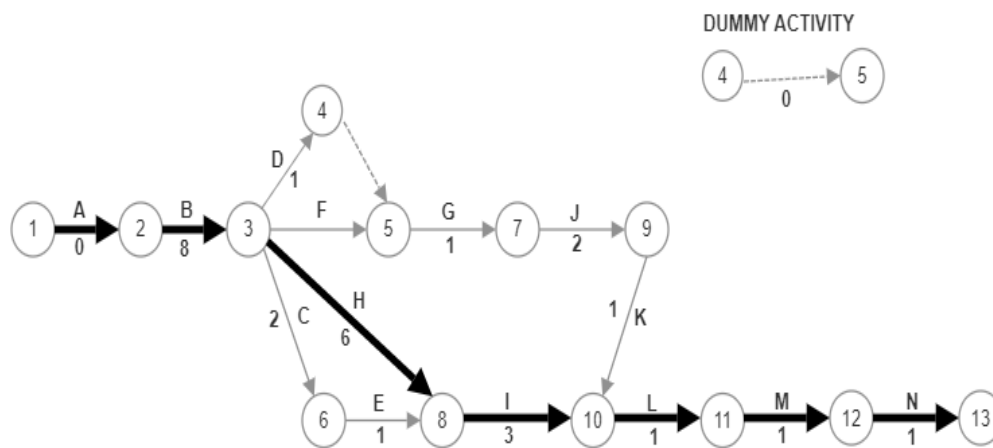
Path – I, 1-2-3-6-8-10-11-12-13   0+8+2+1+3+1+1+1 = **17 days**

Path – II, 1-2-3-8-10-11-12-13   0+8+6+3+1+1+1 = **20 days**

Path – III, 1-2-3-5-7-9-10-11-12-13   0+8+3+1+2+1+1+1+1 = **18 days**

Path –IV, 1-2-3-4-5-7-9-10-11-12-13   0+8+1+0+1+2+1+1+1+1 = **16 days**

The longest path is**:** Path – II, 1-2-3-8-10-11-12-13 **which takes 20 days.** This path is called the critical path. The network diagram represents the critical path by thick arrows to indicate the critical path.

9(a)	**Various phases of Project Review** 1. Initial review 2. Performance evaluation 3. Abandonment analysis 4. Behavioural issues in project abandonment 5. Administrative aspects of capital budgeting 6. Evaluating the capital budgeting system of an organization	**05**
9(b)	**Discuss the differences between Augmented reality (AR) and Virtual reality.**	**05**

Augmented Reality	Virtual Reality
1. Combination of digital and real world.	1.Totally artificial digital world.
2. User experience is partially immersed.	2. Complete sense of immersion.
3. Camera-enabled devices such as smart phone, tablet or smart glasses are required. Desktop and lap-top are not suitable because of its fixed camera position, unless an external camera is used.	3.Special hardware equipment is required (Microsoft Hololense, HTC vive, oculus right, Google daydream, etc).
4. Latest versions of common operating systems are good enough (Android, IOS, Windows).	4. Special software is required.
5. Initial cost is lower than the VR.	5. Initial cost is higher than the AR.

9(c)	**Ananlyse the uses of Network Techniques. (FIVE)**	05
	Following are the uses of network technique to the management:	

    i.   It indicates the start and finish time of each activity of the project.

    ii.   It helps in better scheduling, monitoring and control of project activities.

    iii.   It helps in better execution of the project.

    iv.   These techniques can serve as indicators of bottle necks and potential trouble spots which help in preventing the pitfalls and progress of the project as per plan.

    v.   This will illustrate the type and extent of co-ordination required among the designers, contractors and other members of the project team.

    vi.   It helps in identifying the critical path.

    vii. It helps in identifying the critical tasks and diversion of resources to these tasks so that they can be completed as per the schedule..

    viii. It helps in resource allocation such as labour, machines etc.

    ix.   It helps to find whether or not advisable to crash project time and the impact of crashing on the cost of the project.

    x.   Helps to find which activities are to be speeded up so as to minimise the cost of escalation due to the crashing.

It helps in controlling the project cost.

9(d)	**List the Steps in data science and data analytics in PM involves**	05

a. Define the question

b. Define the ideal dataset

c. Determine what data you can access

d. Obtain the data and clean the data

e. Exploratory data analysis

f. Statistical prediction/modelling

g. Interpret results

h. Challenge results

i. Synthesis/write up results

j. Create reproduceable code.

<div align="center">OR</div>

10(a)	**Distinguish between PERT and CPM in Project management.**	05

PERT	CPM
Stands for "Project Evaluation and Review Technique".	Stands for "Critical Path Method".
PERT is appropriate where time estimates are uncertain for activities.	CPM is good when time estimates are found with certainty.
It is concerned with events, which are the beginning or ending points of operation.	It is concerned with activities.
Suitable for non-repetitive projects.	Suitable for repetitive projects.
Can be analysed statistically.	Cannot be analysed.
PERT is not concerned with relationship between time and cost.	CPM establishes a relationship between time and cost.
It is probabilistic in nature.	It is deterministic in nature.
It can be applied only for big projects.	It can be applied for both big and small projects.
It is based on THREE-time estimates.	It is based on SINGLE-time estimate.

10(b)	**Discuss the applications of Internet of Things** 1. Smart Homes: automatic illusion system, Voice operated fans and AC's, etc. 2. Smart City: Traffic management, electricity management etc. 3. Self-driven Cars 4. IoT Retail Shops: Amazon etc. 5. Farming: drip irrigation, water distribution, etc. 6. Wearables: wellness to fitness etc. 7. Smart Grids: 8. Industrial Internet 9. Telehealth: remote medical diagnostic etc. 10. Smart Supply-chain Management: 11. Traffic management 12. Water and Waste management		**05**
10(c)	**List the benefits of AR and VR in project management. (FIVE)** • Increase in competitive ability. • Increase in efficiency and productivity. • Reduces time and costs. • Reduces errors and facilitates work processes. • Enables fast remote support for repairing systems weakness. • Enable fast and remote collaboration. • Involve innovation support. • Facilitate to understand large amounts of data. • Facilitate decision making problems solving. • Facilitates monitoring of projects. • Reduces the project validation risks.		**05**
10(d)	**Analyse the steps in project audit program** ***Project audit program:*** ➢ The project audit aims to obtain a clear picture of the actual status of the project from time to time. ➢ The detailed audit program involves the following steps: ***Step 1:*** Preliminary examination of the project's organization, administration, record keeping, planning and control and working methods and techniques performed in order to establish project current and future status. ***Step 2:*** Preparing the statements of project current and future status, giving a detailed list of completed work as compared with the project's performance baseline, recording the cost and quality aspects, record keeping, working methods and communication aspects. ***Step 3:*** Conducting preliminary analysis and presenting results in the form of audit report.		**05**