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Odd Semester

ST-2 : Model Solution

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Subject Name :- Software Project Management

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Section-A

A- Attempt all the parts (5*2=10)

1- How does the Milestone chart helps in scheduling ?

Ans:- A milestone chart indicates what project has to achieve and the inter-relationships between different milestones. It will provide an overview of the entire project. Depending on the complexities and the size of the projects, the number of milestones is fixed.

Note that too many milestones may blur the overview picture. So, we must fix the milestone in such a way that it indicates some form of end point or when the work is complete and is of good quality.

2. What do you mean by Code Review ? Why it is needed in project ?

Ans:- Code Review:- Code Review is a systematic examination (often known as peer review) of computer source code. It is intended to find and fix mistakes overlooked in the initial development phase, improving both the overall quality of software and developer's skills.

Why Code Reviews are needed in project ?

(1) To spot and fix defects early in the process.
(2) Better-shared understanding of the code base as team members learn from each other.
(3) Helps to maintain a level of consistency in design and implementation
(4) Helps to identify common defects across the team thus reducing rework.
(5) Builds confidence of stakeholders about technical quality of the execution

(6a)

(3) Differentiate between Schedule Performance Index (SPI) & Cost Performance Index (CPI).

Ans:- SPI →

* The schedule Performance Index indicates how efficiently you are actually progressing compared to the planned project schedule

"The SPI is a measure of schedule efficiency, expressed as the ratio of earned value to planned value".

* The SPI gives you information about the schedule performance of the project. It is the efficiency of the time utilized on the project

$$SPI = \frac{\text{Earned value}}{\text{Planned value}}$$

CPI → * The Cost Performance Index helps you analyze the efficiency of the cost utilized by the project. It measures the value of the work completed compared to the actual cost spent on the project

"The cost performance Index is a measure of the cost efficiency of budgted resources, expressed as a ratio of earned value to actual cost."

* The cost performance Index specifies how much you are earning for each dollar spent on the project. The cost performance Index is an indication of how well the project is remaining on budget.

$$CPI = \frac{\text{Earned value}}{\text{Actual Cost}}$$

(4) Explain the steps for software estimating using function Point Analysis (FPA).

Ans:-

Steps for s/w estimating using FPA → (Size, Duration, cost)

(1) To budget application development or enhancement cost. (functional size of the information system to be developed)

(2) To budget the annual maintainance cost of the application portfolio (standard productivity Rate for the development environment)

(3) To determine project productivity after completion of the project (expected project productivity Rate).

(4) To determine the s/w size for cost estimating (Budget the project).

FPA five components — (1) External input types (2) External o/p types (3) External Inquiry types (4) Logical internal file type (5) External interface file type

(5) Differentiate between PERT & CPM.

Ans:-

PERT	CPM
(1) It basically deals with time estimate	It deals with both time & cost.
(2) It is probabilistic	It is deterministic
(3) It takes into consideration three time estimates	It is based on single time estimate
(4) Estimates are based on past experience, most likely & not sure timings	Estimates of activity are based on historical data
(5) Estimates are uncertain. It talks of ranges of duration (B-curve) & probability than an activity will fall into that range.	only one number is used for an activity's time estimate.

Section B

B. Attempt all the parts (5*5 = 25)

6- What is mean by proof of correctness? Also discuss the difference between Code Inspection and Code walkthrough?

Ans:-

Proof of Correctness → Can be defined as the adherence to the specifications that determine how users can interact with the software & how the software should behave when it is used correctly.

If the software behaves incorrectly, it might take considerable amount of time to achieve the task, or sometimes it is impossible to achieve it.

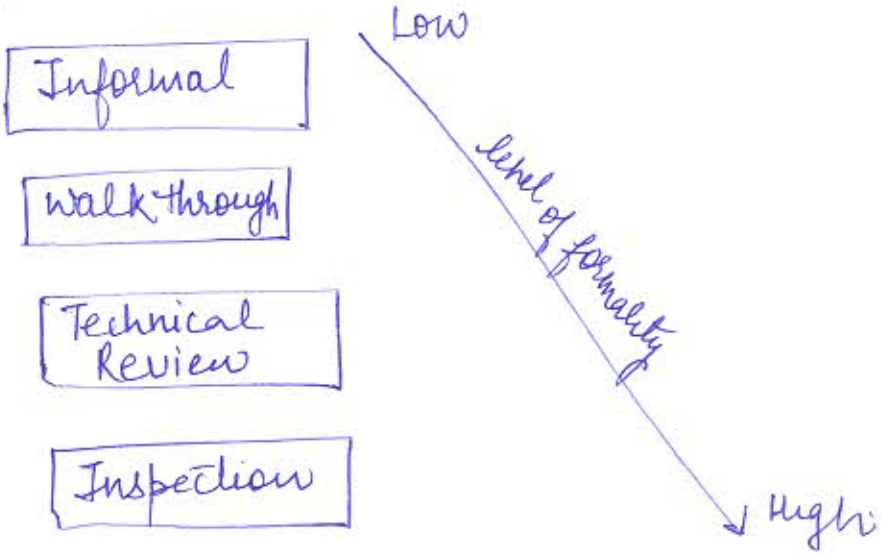
Rules:→

- Defining the program completly.
- Develop the algorithm & then the program logic
- Reuse the correctness of algorithms during the design phase.
- Developers should pay attention to the clarity & simplicity of your program.
- Verifying each part of a program as soon as it is developed.

"A proof of correctness is a mathematical proof that a computer program or a part thereof will, when executed, yield correct results, i.e results fulfilling specific requirements. Before proving a program correct, the theorem to be proved must, of course, be formulated."

Difference between the Code Inspection Code walkthrough?-

Code Inspection:-



Code Inspection is the most formal type of Review, which is a kind of static testing to avoid the defect multiplication at a later stage.

→ The main purpose of code Inspection is to find defects and it can also spot any process improvement if any.

→ An inspection report lists the finding, which include metrics that can be used to aid improvements to the process as well as correcting defects in the document under review.

→ Preparation before the meeting is essential, which includes reading of any source documents to ensure consistency.

→ Inspection are often led by a trained moderator, who is not the author of the code.

→ Inspection process is the most formal types of review based on rules and checklists & make use of entry & exit criteria.

→ It usually involves peer examination of the code & each one has a defined set of roles.

→ After the meeting, a formal follow-up process is used to ensure that corrective action is completed in a timely manner.

Code Walkthrough →

Code walkthrough is a form of peer review in which a programmer leads the review process & the other team members ask questions & spot possible errors against development standards & other issues.

→ The meeting is usually led by the author of the document under review & attended by other members of the team.

→ Review sessions may be formal or informal.

→ Before the walkthrough meeting, the preparation by reviewers and then a review report with a list of findings.

→ The scribe, who is not the author, marks the minutes of meetings and note down all the defects / issues so that it can be tracked to closure

→ The main purpose of walkthrough is to enable learning about the content of the document under review to help Team members gain an understanding of the content of the document & also to find defects.

(7) What are benefits of using work breakdown structure (WBS)? What is a critical path? Why is it important to identify the critical path.

Ans Benefits of using work breakdown structure -

WBS → Dividing complex projects to simpler and manageable tasks is the process identified as work breakdown structure

Usually, the project managers use this method for simplifying the project execution. In WBS, much larger tasks are broken down to manageable chunks of work. These chunks can be easily supervised and estimated.

WBS is not restricted to a specific field when it comes to application. This methodology can be used for any type of project management.

Following are a few reasons for creating a WBS in a project

- → Accurate and readable project organization
- → Accurate assignment of responsibilities to the project plan
- → Indicates the project milestones and control points
- → Helps to estimate the cost, time & risk
- → Illustrate the project scope, so the stakeholders can have a better understanding of the same.

Benefits of Using work breakdown structure →

(1) WBS forces the team to create detailed steps

The WBS forces the project managers, team members, & customers to delineate the steps required to build and deliver the product or service. The exercise alone encourages a dialouge that will help clarify ambiguities bring out assumptions, narrow the scope of the project, & advise critical issues early on.

(2) WBS lays the groundwork for schedule & budget →

It lays the groundwork for developing an effective schedule & good budget plans. A well-defined WBS enables resources to be allocated to specific tasks, helps in generating a meaningful schedule & makes calculating a reliable budget easier.

(3) WBS creates Accountability →

The level of detail in a WBS makes it easier to hold people accountable for completing their tasks. With a defined WBS, people can't hide under the "cover of broadness". A well-defined task can be assigned to a specific individual who is then responsible for its completion.

(4) WBS creation breeds commitment →

The process of developing and completing a WBS breeds excitment & Commitment. Although the project manager will often develop the high-level WBS, he will seek the participation of his ~~own~~ core team to flesh out the extreme detail of the WBS. This participation will spark ~~inte~~ involvement in the project.

ee Of course, developing a WBS is not easy. It can be a painstaking process. And it can take quite a bit of time. A large WBS (one that identifies several thousand activities) can take many; many hours to develop. For another, it requires effort. There is a knowledge transfer & and exercise of brainpower. The larger the scope of the project, the larger the WBS will be. The WBS requires continual refinement.

Critical path :→ A critical path is the longest sequence of activities in a project plan which must be completed on time for the project to complete on due date. An activity on the critical path cannot be started until its predecessor activity is complete.

Although many projects have only one critical path, some projects may have more than one critical paths depending on the flow logic used in the project.

If there is a delay in any of the activities under the critical path, there will be a delay of the project deliverables.

Why is it important to identify the critical path?

Critical path allows you to identify the most important tasks in your project. Here are three more ways critical path can make your project a success-

→ Reduces timelines: when the critical path method is displayed as a BAR CHART, like a GANTT CHART, it is easy to see where the tasks fall in the overall timeframe

→ Offer a visual Representation of the project activities

→ Presents the time to complete the task & the overall projects.

→ Tracking of critical activities

(8) Differentiate the purpose of using network diagrams, Gantt chart & tracking Gantt chart?

Ans:→ Purpose of using n/w diagrams, Gantt chart & tracking Gantt chart:→

Network diagrams→ are important tool for project mgmt. It uses various linkages to show the chronological sequences of various tasks involved in project management It basically defines the flow- work and can be compared to a flowchart. The tasks are often shown or dipicted using a node. The linkages are arrows, that links the tasks & the direction is according to the

defined dependency. A sequence of activities from start to finish is known as path. The longest duration path is known as the critical path & also defines the expected project completion time.

Network diagrams are very useful in project planning & control. There are two version of network diagrams

(i) Activity on Arrow version is used for projects with many dependencies and emphasizes on events. It is easier to flag the milestones.

(ii) Activity on Node version is easier to draw for simpler projects & emphasizes on activities.

Gantt chart :→ A Gantt chart is a tool used for project management. It is used to represent the timing of various tasks that are required to complete a project.

A Gantt chart is a time line chart that is used as a project management tool to illustrate how the project will run. You can view the individual tasks, their durations and the sequencing of these tasks. View the overall timeline of the project and the expected completion date.

Tracking Gantt chart - The tracking Gantt chart displays the Baseline as well as the Actual information of your project. If you haven't saved the Baseline, then all you will be seeing in the Tracking Gantt view is a thin version of the Gantt chart with % complete information instead of Resources names besides the tasks. As mentioned, tracking Gantt displays the Project Calender for its non working Time by default.

(9) What are the different techniques for Project monitoring and control?

Ans:→ Techniques for Project Monitoring and Control →

4 Categories

- Earned value Techniques
- collection of Project performation Information
  - Pulse Meeting
  - VarianceReports
  - Program Reviews
- Analysis of the project performance - to determine whether a project change is needed
  - Technical Reviews
  - Project forecasting
  - Problem Solving
- Reporting on Project Performance
  - Project Management Information system
  - Management Reviews.
  - Dashboards.
- Management of Project Change
  - Change Management log.

Project Monitoring and control can be done by -

(a) Measuring the technical progress.
(b) Measuring stability.
(c) Measuring modularity.
(d) Measuring maturity
(e) Measuring financial Status.

Measuring Technical progress → Requires size metrices for each time
for example - (a) No. of LOC under baseline (Development Team)
(b) No. of defects found (Test Team)
(c) No of critical use cases that have been demonstrated (Architecture team).

Size matrics & quality metrics must be viewed together.

Measuring stability - means measuring the rate of new change requests corresponding to the defects in the system. Once an initial version of the system is baselined, change requests are issued to control & track changes to the baseline. If the work completion indicates that the project is almost finished but the rate of change requests is still high then the project may not be achieving its target quality goals.

Measuring Modularity → of a project can be another dimension we talk in terms of the breakage. It is the measure of the ~~project~~ impact of a change on the baseline. (It is measured in terms of LOC, number of files, FP etc).

Measuring maturity → is another dimension of project monitoring & controlling. As we know that Mean Time Between failures (MTBF) measures the time b/w discovered defects during testing. The maturity of a project increases as the project moves towards completion.

Note that a decreasing maturity shows that developers are under pressure (patching) to satisfy user's requests.

(10) Discuss beiefly about the cost variance and Schedule variance with example?

Ans:→

Cost variance (CV):→

This is calculated as EV-AC and indicates that difference between the earned value or budgeted cost and the actual cost of completed work.

Schedule Variance (SV)

The schedule variance is measured in cost terms as EV-PV and indicates the degree to which the value of completed work differs from that planned.

for example → The work with a Planned value (PV) = 40,000 ₹. should have been completed by now.
If fact, some of that work has not been done so that EV is only 35,000 ₹

$$SV = EV - PV = 35000 - 40000$$
$$= -5000 ₹$$

A (-ve) SV means project is behind schedule.

& 25,000 ₹ had actually been spent to the EV.

The CV = 35000 - 55000 = - 20,000 ₹.

It can also be an indicator of the accuracy of the original cost estimate.

A (-ve) CV means that the project is over cost.

Section C

C- Attempt all the parts (2 * 7.5 = 15)

(11) What is project scheduling? List & discuss the various project scheduling activities. What are the benefits of agile project management?

Ans: Project Schedules:→ Before work commences on project or possibly, a stage of a larger project, the project plan must be developed to the level of showing dates when each activity should start and finish & when & how much of each resource will be required.
Once the plan has been refined to this level of detail we call it a project "schedule".

Creating a project schedule comprises four main stages

- Ideal Activity plan (what activities need to be carried out & in what order they are to be done).
- Activity Risk Analysis (aimed at identifying potential problems)
- Resource Allocation (The expected availability of resource might place constraints on when certain activities can be carried out)
- Schedule production
  (Once resources have been allocated to each activity, we will be in a position to draw up & publish a project schedule, which indicates planned start & completion dates & a resource requirements statements for each activity.

Project scheduling Activities -

→ Defining Activities

- A project is composed of a no. of interrelated activities
- A project may start when at least one of its activities is ready to start
- A project will be completed when all of the activities it encompasses have been completed.
- An activity must have a clearly defined start & a clearly defined end-point normally marked by the production of a tangible deliverable.
- If an activity requires a resource (as most do) then that resource requirement must be forecastable & is assumed to be required at a constant level throughout the duration of the activity.
- The duration of an activity must be forecastable - assuming normal circumstances, & the reasonable availability of resources.
- Some activities might require that others are completed before they can begin (procedence requirement)

→ Identifying Activities

Three approaches
- Activity based approach
- The product based approach
- Hybrid approach.

(a) **Activity based Approach:-** The activity based approach consists of creating a list of all the activities that the project is thought to involve. When listing activities, particularly for a large project, it might be helpful to subdivide the project into the main life-cycle stages & consider each of these separately.

(b) The Product-based Approach:- It consists of producing a Product breakdown structure & a Product flow diagram. The PFD indicates, for each product, which other products are required as I/Ps. The PfD ~~indicates~~ can therefore be easily transformed into an ordered list of activities by identifying the transformation that turn some products into others.

(c) The Hybrid Approach:- is based entirely on a structured of activities, which is in turn based on a simple list of final deliverables and for each deliverable, a set of activities required to produce that product.

Sequencing and Scheduling Activities →

Throughout a project, will require a schedule that clearly indicates when each of the project's activities is planned to occur & what resources it will used.

We have sequenced the tasks (that is, identified the dependencies among activities dictated by the development process) & scheduled them (i.e specified when they should take place). The scheduling has lead to take account of the availability of staff & the way in which the activities have been allocated to them.

" On larger projects it is better to separate out these two activities
- To sequence the task according to their logical relationship. & then
- To schedule them taking into account resources & other factors.

Benefits of agile project managements are:-

(1) High product quality :→

In Agile development, testing is integrated during the cycle which means that there are regular checkups to see that product is working during development. This enables the product owner to make changes if needed and the team is aware if there are any issues.

- Defining and elaborating requirements just in time so that the knowledge of the product features is a relevant as possible.

→ Incorporating continuous integration & daily testing into the development process, allowing the development team to address issues while they are still fresh.

→ Taking advantages of automated testing tools.

→ Conducting ~~sprit~~ sprint retrospectives, allowing the scrum team to continously improve processes & work.

→ completing work using the definition of done:- developed, tested, integrated & documented.

(2) Higher Customer Satisfaction -

The product owner is always involved, the progress of development has high visibility & flexibility to change is highly important. This implies engagement & customer satisfaction

→ Demonstrating working functionalities to customers in every sprint review.

→ Delivering products to mkt quicker & more often with every release. The clients get early access to the product during the life cycle.

→ Keeping customers involved & engaged throughout projects.

3- Increased project Control →

- Sprint Meetings
- Transparency
  → Jira meeting (visibility of each step of the project for both parties)

4- Reduced Risks -

→ Agile methodologies virtually eliminate the chances of absolute project failure.

→ Always having a working product, starting with the very first sprint, so that no agile project fails completely.

5- Faster ROI →

The fact that agile development is iterative means that the features are delivered incrementally, therefore, benefits are realised early while the product is in development process.

→ Development starts early.

→ A functional 'ready to ~~prod~~ market' product after few iterations

→ First Mover Advantage..

→ Long delivery cycles are often a problem for businesses, particularly those in fast-moving markets.

→ Focusing on Business Value. By allowing the client to determine the priority of features the team understands what's most important to the client's business, & ~~the~~ can deliver features in the most valuable order.

(12) What is mean by earned value Analysis? What are the different types of earned value indicators? Describe any two earned value indicators with suitable examples.

Ans :→

Earned Value Analysis → "Earned value analysis is based on assigning a 'value' to each task or work package (as identified in the WBS) based on the original expenditure forecasts".

Earned value management is a method for integrating scope schedule and resources for measuring project performance. It compares the amount of work or effort that was planned with what was actually earned & spent to determine if cost & schedule performance are as planned.

Earned Value Indications

Archibadel defines the three main indications for earned value. They are as follows :-

(a) Budgeted cost of work schedule (BCWS) or Planned value (PV).

(b) Budgeted cost of work performed (BCWP) or Earned value (EV)

(c) Actual cost of work performed (ACWP) or Actual Cost (AC).

(a) Budgeted cost of work Scheduled (BCWS) or Planned Value (PV)

BCWS is defined as the original budgeted cost for the item. It is the cost of each task or work packages as per the budget.

BCWS is plotted against time scale in a graphical form

(b) Budgeted Cost of work Performed (BCWP) or Earned Value (EV)

A task that has not started is assigned the value zero. When it is completed it is credited with the value of the task. The total value credited to a project at any point is known as the earned value (EV) or BCWP. It can be represented as a value or as a percentage of the PV.

Where tasks have been started but are not yet complete, some consistent method of assigning an EV must be applied. Common methods in S/w projects are as follows:-

(a) 0/100 Techniques:- A task is assigned a value of zero until such time that is completed.

(ii) 50/50 techniques - A task is assigned a value of 50% of its value as soon as it is started. Then it is given as value of 100% once it is complete.

(iii) Milestone Technique - ~~A task is assigned a value of 50% of its value as soon as it is started.~~

A task is given a value based on the achievement of milestones.

(c) Actual cost of work Performed (ACWP) or Actual cost (AC)

The actual cost of each task can also be collected. It is known as the actual cost of work ~~perfor~~ performed (ACWP) or Actual cost (AC). ACWP is plotted against time scale for effective WBS control. It can be equal, more or less than BCWP. This depends on the following conditions :—

(1) ACWP = BCWP (when project continues as per plan)
(2) ACWP > BCWP (when there is cost overrun)
(3) ACWP < BCWP (when there is cost underrun).