Q. Characteristics of risk
Answer: - (Page 84)
A risk has two characteristics:
• Uncertainty - the risk may or may not happen
• Loss - if the risk becomes a reality, unwanted consequences or losses will occur.

Q. Types of reviews
Answer: - (Page 110)
There are many types of reviews. In general they can be categorized into two main categories namely informal and formal technical reviews.

Q. When a system called legacy system
Answer: - (Page 134)
A system is considered to be a legacy system if it has been in operation for many years. A legacy system has many components. These include business processes, business rules, application software, application data, support software, and system hardware.

Q. Difference between synchronous and open paradigm
Answer: - (Page 32)
• open paradigm—attempts to structure a team in a manner that achieves some of the controls associated with the closed paradigm but also much of the innovation that occurs when using the random paradigm
• synchronous paradigm—relies on the natural compartmentalization of a problem and organizes team members to work on pieces of the problem with little active communication among themselves.

Q. If SCM is not its proper place then what are disadvantages?
Answer: - (Page 119)
Software configuration management (SCM) is one of the five KPA required for an organization to be at CMM level 2. That means, according to SEI, effective project management is not possible without having a proper SCM function in place.
The basic idea behind SCM is to manage and control change. As mentioned by Bersoff, no matter where you are in the system life cycle, the system will change, and the desire to change it will persist throughout the life cycle. It is therefore essential that we manage and control it in a fashion that this continuous change does not convert into chaos.

Requirement attributes
Answer: - (Page 127)

We need to tag requirements with certain attributes in order to manage them in an orderly fashion. Attributes are used to establish a context and background for each requirement. They go beyond the description of
intended functionality. They can be used to filter, sort, or query to view selected subset of the requirements. A list of possible attributes is enumerated as below:
1. Requirement ID
2. Creation date
3. Created by
4. Last modified on
5. Last modified by
6. Version number
7. Status
8. Origin
9. Subsystem
10. Product Release
11. Priority

Why in the software engineering measurements are collected?
Answer: (Page 65)
Because Measurement helps in identification of the problem as well as in determining the effectiveness of the remedy. A software engineers collects measures and develops metrics and indicators.

Fault tree can be used to predict the chain of events?
Answer: (Page 117)
Analysis techniques such as fault tree analysis can be used to predict the chain of events that can cause hazards and the probability that each of these events will occur to create the chain.

"Message chain" can be a bad smell in the coding justifies it with reason?
Answer: (Page 144)
A client asks an object for another object and then asks that object for another object etc. Bad because client depends on the structure of the navigation

CCB stands for what?
Answer: (Page 124)
CCB stands for Change Control Board

Write down the guide line to make a review meeting success full?
Answer: (Page 113)

The followings are guide lines to make review meeting successful: · Avoid drift
• Limit debate and rebuttal
• Enunciate problem areas but don't try to solve all problems
• Take written notes
• Limit the number of participants and insist upon advanced preparation
• Develop a checklist for each product that is likely to be reviewed
• Allocate resources and schedule time for FTRs
• Conduct meaningful training for all reviewers
• Review your early reviews
• Determine what approach works best for you

What characteristics of extreme programming make it different to the other life cycle models?
Answer: (Page 23)
One very important feature of eXtreme programming is the concept of pair programming. In this, a team of two developers develop the software, working in team as a pair to the extent that they even share a single computer.

If the requirements are not traceable then what will be the impact on the requirement management?
Or
Traceability impact on software?3
Answer: (Page 133)
Requirement traceability is a very important consideration for requirement management. It is really hard to manage requirements that are not traceable.

A technical review meeting is attended by the Review leader, the reviewer and the producer. Write the roll of producer and the reviewer in the meeting?
Answer: (Page 112)
The producer informs the PM that the WP is ready and the review is needed. Review meeting is attended by the review leader, all reviewers, and the producer. One of the reviewers takes the roles of recorder. Producer walks through the product, explaining the material while other reviewers raise issues based upon their advanced preparation.

Whenever change is required, CCB decide allow to happen or deny. If it is decided that change is necessary it is needed ECO engineer change order is generated. What types of information are depicted by ECO?
Answer: (Page 124)
An ECO defines the change to be made, the constraints that must be respected, and the criteria for review and audit. The change control process thus involves the following steps.
1) Need for change is recognized

2) Change request from user

3) Developer evaluates

4) Change report is generated

5) Change control authority (CCA) decides

6) Either step 6a or 6b is performed. Steps numbers 7 to 17 are performed only if step 6b is performed.

a)

       i) Change request is denied

       ii) User is informed

       iii) No further action is taken.

b) Assign people to SCIs

7) check-out SCIs

8) Make the change

9) review/audit the change 10) check-in SCIs

11) Establish a "baseline" for testing

12) Perform SQA and testing activities 13) check-in the changed SCIs

14) Promote SCI for inclusion in next release 15) rebuild appropriate version

16) review/audit the change

17) Include all changes in release

Thus, a change is incorporated in a controlled and strict manner.

We can ensure the 100% risk free software development process, can we guarantee that during the entire software development process there will b no occurrence of any risk. Comment with the reason?

Answer:- Click here for detail

Let's be clear: there's no such thing as risk free software. You can't do anything without taking some risk. But what's easy to overlook, is that not doing something is a risk, too.

Not fixing a bug runs the risk that its more serious than you thought; more prevalent than you thought; that it

could happen to an important customer, someone in the press, or a highly valued customer - with real revenue

risk. You run the risk that it collides with another, as yet unknown bug, potentially multiplying the pain.

Sometimes not releasing feels like the safest thing to do - but you're releasing software because you know

something is wrong.

So what are you going to do? No business wants to accept risk, you have to mitigate it somehow. The simple, easy and wrong thing to do is to add more process. The braver decision, the right decision, is to make it easy to undo any mistakes.

Why the "Large classes" and "Duplicate code" are considered as bad smell give at least one reason for each?

Answer: (Page 143)

Large classes try to do too much, which reduces cohesion.
If you modify one instance of duplicated code but not the others, you (may) have introduced a bug!

Is this correct that in the Reverse engineering we move from lower abstraction to the higher abstraction level?
Answer: (Page 139)
Yes, Reverse engineering for software is a process for analyzing a program in an effort to create a representation of the program at a higher level of abstraction than the source code.

1. Differentiate between fountain model and RUP. (2)
Answer: (Page 23)
Fountain model is another object-oriented lifecycle model. In this model the circles representing the various phases overlap, explicitly representing an overlap between activities. In Rational Unified Process (RUP) model a software product is designed and built in a succession of incremental iterations. The process emphasizes that during development, all activities are performed in parallel, however, and at a given time one activity may have more emphasis than the other.

Formula for MTBF. (2)
Answer: (Page 116)
MTBF = MTTF + MTTR

A student claims that requirement errors are most common type of software errors and are most costly to fix. Do you agree? (2)
Answer: (Page 127)
Yes, Agree.
Project success depends on good requirement management. It may be recalled that requirement errors are the most common type of software development errors and the most costly to fix. It may also be recalled that requirement errors are listed as one of the roots causes of software project failure.

Which one is the ad hoc level? Level-1 or Level-2 or Level-3? (2)
Answer: (Page 12)
Level 1 - Initial is also called ad hoc level.

How defect removal efficiency can be increased by revision? Explain. (3)
Answer: (Page 68)
Defect removal efficiency is the measure of how many defects are removed by the quality assurance processes before the product is shipped for operation.

Factors related with revision
• Maintainability
- Effort required to locate and fix an error in a program
• Flexibility
- Effort required to modify an operational program
• Testability
- Effort required to test a program to ensure that it performs its intended function

State the advantages of waterfall model that are helpful for project managers. (3)
Answer: Click here for detail
Simple and easy to understand and use.
Easy to manage due to the rigidity of the model - each phase has specific deliverables and a review process. Phases are processed and completed one at a time.
Works well for smaller projects where requirements are very well understood.

Write down the format of the compound number normally used for release versioning (3)
Answer: (Page 122)
Although there is no industry standard, typically, a three field compound number of the format "X.Y.Z" is used.
The different fields communicate functionality information about the product release.
The first digit, X, is used for the major release number which is used to identify a major increase in the product
functionality.
The second digit, Y, stands for feature release number. The feature release number is iterated to identify when a set of product features have been added or significantly modified from their originally documented behavior.
The third digit, Z, is called the defect repair number and is incremented when a set of defects is repaired.

Differentiate between organizational maturity and process capability. (3)
Answer: (Page 170)
Organizational maturity is the focus of the staged representation, whereas process area capability is the focus of the continuous representation.
Organizational maturity and process area capability are similar concepts. The difference between them is that organizational maturity pertains to a set of process areas across an organization, while process area capability deals with a set of processes relating to a single process area or specific practice.

A chat messenger is released and its version is 1.0.0 .it only posses chat functionality now. After 1 year, there are different major features are added like audio/video calls, files sharing and data sharing. Now what version numbers these chat messenger posses? (5)

Answer: (Page 122)

After 1 year version number will 2.0.0, conventionally, a release number starts with a major number of one, followed by zero for its feature and Maintenance numbers. This results in a release number 1.0.0. The first digit, X, is used for the major release number which is used to identify a major increase in the product functionality. The major release number is usually incremented to indicate a significant change in the product functionality or a new product base-line.

Q. Two parameter of legacy system? (2marks)
Answer: - (Page 135)

A legacy system can be accessed from two different perspectives - business value and quality.

Q. Forward and reverse engineering?(2marks)
How Forward engineering is different from Reverse engineering? (5 marks)
Answer: - (Page 139)

Reverse engineering for software is a process for analyzing a program in an effort to create a representation of the program at a higher level of abstraction than the source code forward engineering requires application of SE principles, methods, and concepts to re-create an existing application.

Q. Do you think that a long parameter list of function /method can be bad smell? (3 Marks)
Answer: - (Page 143)

Long Method
- Long methods are more difficult to understand; performance concerns with respect to lots of short methods are largely obsolete.
Long Parameter List
- Hard to understand, can become inconsistent

Q. Occurrence of a software does not necessary result in a hazard or mishap do you agree or not (3 marks)
Answer: - (Page 117)

Yes, agree.
Reliability and safety are closely related. Software reliability uses statistical techniques to determine the likelihood that a software failure will occur. Occurrence of a software failure does not necessarily result in a hazard or mishap. On the other hand, software safety examines the ways in which failures result in conditions that can lead to a mishap.
Is it true Poka-Yoke technique deals with project planning?
Answer: - (Page 118)

Poka-yoke is a Quality Assurance and Documentation technique. Poka-yoke devices are mechanisms that lead to prevention of potential quality problem before it occurs or the rapid detection of quality problems if they are introduced.

What are the appropriate situations to scrap a legacy system? (3)
Answer: - (Page 135)
This is the case when system is not making an effective contribution to business processes and business processes have changed significantly and the organization is no longer completely dependent upon the system.

What is effort validation?
Answer:- (Page 93)
Every project has a defined number of staff members. As time allocation occurs, the project manager must ensure that no more than the allocated number of people has been scheduled at any given time.

Do you think it is difficult to implement CMM level in small software companies?
Answer: -
Small software organizations, and small team projects (such are all students projects at universities) may find it difficult to achieve higher levels of maturity according to the CMM, since many of the key practices suggested by this model are inappropriate to small businesses and projects. Small project teams cannot cope with the overheads produced by the amount of documentation required by the CMM and they must use combined documents to reduce time. In small projects, teams usually have a flat structure, resulting in developers being assigned several roles due to scarce resources.

Many times we tag requirements with certain attributes e.g., Requirement ID, requirement Status, list any two advantages of such tags.
Answer:- (Page 128)
Attributes are used to establish a context and background for each requirement. They go beyond the description of intended functionality. They can be used to filter, sort, or query to view selected subset of the requirements.

Difference between measure and matrix
Answer:- (Page 65)
Within the software engineering domain, a measure provides a quantitative value of some attribute of a process or a product. Software metric relates individual software measures to provide a normalized view.

Write four reasons to migrate the legacy system
Answer:- (Page 135)
1. Scrap the system completely: This is the case when system is not making an effective contribution to business processes and business processes have changed significantly and the organization is no longer completely dependent upon the system.

2. Continue maintaining the system: This option is used when system is still required, it is stable, and requirements are not changing frequently

3. Transform the system in some way to improve its maintainability: this option is exercised when system quality has been degraded and regular changes to the system are required.

4. Replace the system with a new system: this path is taken when old system cannot continue in operation and off-the shelf alternative is available or system can be developed at a reasonable cost.

Which is individual level in CMM?
Answer:- (Page 12)
level   1

2 what is SCI in respect to SCM?
Answer:- (Page 120)
A Software Configuration Item (SCI) is the information that is created as part of the software engineering
process.

"Baseline requirements affects to trace" is it true or false?
Answer:
True.

What is software reliability?
Answer:- (Page 115)
Software reliability is another very important quality factor and is defined as probability of failure free operation of a computer program in a specified environment for a specified time. For example, a program X can be estimated to have a reliability of 0.96 over 8 elapsed hours.

RMMM what defines?
Answer:- (Page 88)
RMMM stands for risk mitigation, monitoring, and management plan.

The SQA techniques are well or not for the development of software systems? give your comments to prove either right or wrong?

Answer:- (Page 108)
An SQA plan is developed for the project during project planning and is reviewed by all stake holders. The plan includes the identification of:
• Evaluations to be performed

• Audits and reviewed to be performed
• Standards that are applicable to the project
• Procedures for error reporting and tracking
• Documents to be produced by the SQA group
• Amount of feedback provided to the software project team

The group participates in the development of the project's software process description. The software team selects the process and SQA group reviews the process description for compliance with the organizational policies, internal software standards, externally imposed standards, and other parts of the software project plan.

How deadline of a product influence quality and resources of product? 3 marks
Answer:- (Page 27)
Delivery deadline directly influences the resources and quality. With a realistic deadline, chances of delivering the product with high quality and reasonable resources increase tremendously as compared to an unrealistic deadline. So a project manager has to first determine a realistic and reasonable deadline and then monitor the project progress and ensure timely delivery.

What is the potential benefit of modifying the source code and data ? 3 marks
Answer:- (Page 139)
We modify source code and data in order to make it amenable to future changes. This includes code as well as data restructuring. Code restructuring requires redesign with same function with higher quality than original
program and data restructuring involves restructuring the database or the database schema. It may also involve code restructuring.

MTTF = 48, MTTR = 4, calculate availability? 5 marks
Answer:-
MTBF = MTTF + MTTR
        = 48+4 =52

Availability = (MTTF/MTBF) x 100
        = (48/52)   x 100 = 92.30

List the Steps of software re engineering? 5 marks
Answer:- (Page 138)
Inventory analysis
Document restructuring
Reverse engineering
Program Restructuring

Data restructuring
Forward Engineering

Interdependency of each compartmentalized step is necessary? What is the effect of interdependency on the overall project? 5 marks
Answer:- (Page 92)
The interdependency of each compartmentalized activity or task must be determined. Some tasks must occur in sequence while others can occur in parallel. Some activities cannot commence until the work product produced by another is available.

The relationship between number of people and time to develop an application is not linear, what do you understand by this statement? (5)
Answer:- (Page 92)
The relationship between the number of people and time to develop an application is not linear. It is not as simple as a 120 man-day project can be developed by 1 person working for 120 days or 120 people working for
1 day. The communication and coordination overhead plays a very significant role.

Comment on the following statement regarding "review meeting" No review is better than an uncontrolled review? (5)
Answer:- (Page 113)
An uncontrolled review can be worse than no review. The basis principle is that the review should focus on the product and not the producer so that it does not become personal. Remember to be sensitive to personal egos. Errors should be pointed out gently and the tone should be loose and constructive.

Do you think that a long parameter list of a function/method can be a 'bad smell', give reasons to support your answer? (3)
Answer:- (Page 143)
Long Parameter List hard to understand, can become inconsistent .

Why is the system being developed in W5HH principle, Explain. (3)
Answer: -The answer to this question all parties to the validity of the business reasons for the software to evaluate. Set in a different way; time not only business people and spending money?
What is software refactoring (2)
Answer:- (Page 143)
Software refactoring is the process of changing a software system such that the external behavior of the system does not change while the internal structure of the system is improved. This is sometimes called —Improving the design after it has been written.

The following code segment sorts an array of integers using "selection sort" algorithm. (3 marks)
for (i=0; i < N-1; i++) {
min = i;
for (j = i; j < N; j++)
if (a[j] < a[min]) min = j; temp = a[i];
a[i] = a[min];
a[min] = temp;

Answer:- (Page 144)
We break it into smaller fragments by making smaller functions out of different steps in the algorithm as follows:
int minimum (int a[ ], int from, int to)
{
int min = from;
for (int i = from; i <= to; i++)
if (a[i] < a[min]) min = i;
return min;
}

void swap (int &x, int &y)
{
int temp = x;
x = y;
y = temp;
}
The sort function now becomes simpler as shown below. for (i=0; i < N-1; i++) {
min = minimum (a, i, N-1); swap(a[i], a[min]);
}

How duplicate code and large classes are bad smells in code?
Answer: (Page 143)
Duplicated Code – bad because if you modify one instance of duplicated code but not the others, you (may) have introduced a bug
! Large Class – Large classes try to do too much, which reduces cohesion.

List the component software reengineering process model?
Answer: (Page 138)
The following process model can be used to reengineer a legacy system:

Inventory analysis Inventory analysis is the first step in the reengineering process. At this stage, inventory of all applications is taken a note of their size, age, business criticality, and current maintainability is made.

Document restructuring The next step in the reengineering process is document restructuring. Weak documentation is a trademark of many legacy applications.
Reverse engineering Reverse engineering is the next step in the process. Reverse engineering for software is a process for analyzing a program in an effort to create a representation of the program at a higher level of abstraction than the source code. Reverse engineering is the process of design recovery.

Program Restructuring Program is restructured after the reverse engineering phase. In this case we modify source code and data in order to make it amenable to future changes. This includes code as well as data restructuring.

Program Restructuring Program is restructured after the reverse engineering phase. In this case we modify source code and data in order to make it amenable to future changes. This includes code as well as data restructuring. Code restructuring requires redesign with same function with higher quality than original program and data restructuring involves restructuring the database or the database schema. It may also involve code restructuring.

How you use Compartmentalization at LMS of virtual university web site.

Answer:
Compartmentalization of LMS into different parts. Just like your home page, profile, grade book, account book etc. you can also compartmentalize it according to your subjects and on the bases of their sub-groups.

When your think the scrap a system completely (legacy system)?- Scrap the system completely:
Answer: (Page 135)
This is the case when system is not making an effective contribution to business processes and business processes have changed significantly and the organization is no longer completely dependent upon the system.

SCI stands for?
Answer: (Page 120)
Software Configuration Item. A Software Configuration Item is the information that is created as part of the software engineering process.

Provide two guidelines to eliminate the individual role from an organization
Answer: (Page 90)
Organize project teams so that information about each development activity is widely dispersed. Decentralized teams generate more and better solutions than individuals and are most useful for complex problems.

Software only fails due to hazards, agree or disagree with comments

Answer: (Page 117)

Occurrence of a software failure does not necessarily result in a hazard or mishap. On the other hand, software safety examines the ways in which failures result in conditions that can lead to a mishap. Software reliability uses statistical techniques to determine the likelihood that a software failure will occur.

Base lining is required for traceability? yes or no?

Answer:

Yes! The entry criteria are Authorized changes are occurred in the baseline requirements and other work products. Requirement Traceability Matrix (RTM) may also be updated due to authorized changes in baseline requirements, test cases and code.

Message chaining in bad smell.

Answer: (Page 144)

Message Chains– a client asks an object for another object and then asks that object for another object etc. Bad because client depends on the structure of the navigation.

Comments in bad smell.

Answer: (Page 144)
· Comments (!)
– Comments are sometimes used to hide bad code
– "…comments often are used as a deodorant" (!)

Steps before doing legacy system migration:

Answer: (Page 135)

Important business rules are often embedded in the software and may not be documented elsewhere. Business processes and the way legacy systems operate are often intertwined. New software development may take several years. New software development is itself risky as changes to one part of the system inevitably involve further changes to other components. We therefore need to assess a legacy system before a decision for migration is made.

Software configuration item include which things?

Answer: (Page 120)
A Software Configuration Item is the information that is created as part of the software engineering process. Typical SCIs include requirement specifications, design specification, source code, test cases and recorded results, user guides and installation manuals, executable programs, and standards and procedures.

CCB and CCA stand for?

Answer: (Page 124)
Change Control Board (CCB)

Change Control Authority (CCA)

Two parameters for assessing Application SW configuration of legacy system?

Answer: (Page 135)
A legacy system can be assessed from two different perspectives – business value and quality. The basic idea behind SCM is to manage and control change.

Keeping in mind CMM which one level is Ad-hoc?

Answer: (Page 172)
Level 1 - Ad hoc (Chaotic) it is characteristic of processes at this level that they are (typically) undocumented and in a state of dynamic change, tending to be driven in an *ad hoc*, uncontrolled and reactive manner by users or events. This provides a chaotic or unstable environment for the processes.

Do you think "being unable to follow standard is risk"?

Answer: (Page 176)
Yes! Specified standards define a set of development criteria that guide the manner in which software is engineered. If the criteria are not followed, lack of quality will almost surely result. So standard must be followed to avoid the risk.

"Software configuration is a design activity"? Agree or not support your answer with logical reason?

Answer: click here for details

Roger Pressman says that SCM is a "set of activities designed to control change by identifying the work products that are likely to change, establishing relationships among them, defining mechanisms for managing different versions of these work products, controlling the changes imposed, and auditing and reporting on the changes made." The SCM leader will analyze all current design specifications and break down the software into subsystems. All subsystems will consist of major software functions or interface components.

Provide any 2 benefits of Requirement Tags?

Answer: click here for details

The requirement tag is a unique identifier for each requirement in a project. A requirement tag is composed of a tag prefix and a unique numerical value. When you add a requirement to a requirements document or database, Rational RequisitePro assigns the requirement the appropriate tag prefix, dependent on its requirement type, and an incremental numerical value.

"CMM in small SW house" do you think small houses/companies can fully implement the all level of CMM?

Answer: (Page 171)

No! I think small houses/companies cannot fully implement the all level of CMM. When holding these ideas to the implementation of CMM, its effects can be imagined. And when some enterprise project management software can not recognize an immediate solution to their problems, they had confidence in the implementation of the CMM started to shake.

You are a SW engineering and you have to calculate the maintenance cost of the reengineering project?

OR

List the factor involved in calculating the cost of reengineering (3 marks)

Answer: (Page 140)

This analysis is carried out in the following manner.

Let

P1 **:** current annual maintenance cost for an application

P2 **:** current annual operation cost for an application

P3 **:** current annual business value of an application

P4 **:** predicted annual maintenance cost after reengineering

P5 **:** predicted annual operations cost after reengineering

P6 **:** predicted annual business value cost after reengineering

P7 **:** estimated reengineering cost

P8 **:** estimated reengineering calendar time

P9 **:** reengineering risk factor (1.0 is nominal)

L **:** expected life of the system

Now the cost of maintenance is calculated as:
C $_{maintenance}$ = [P3 – (P1 + P2)] x L

Cost of reengineering would then be given by the formula:
C $_{reengineering}$ = [P6 – (P4 + P5) x (L – P8) – (P7 x P9)]

List some of the artifact related to the software testing that can be treated as software configuration?

Answer: (Page 120)

A Software Configuration Item is the information that is created as part of the software engineering process. Typical SCIs include requirement specifications, design specification, source code, test cases and recorded results, user guides and installation manuals, executable programs, and standards and procedures (for example C++ design guidelines)

Requirement attributes (6)

Answer: (Page 128)

1. Requirement ID

2. Creation date

3. Created by

4. Last modified on

5. Last modified by

6. Version number

7. Status

One Example Code Duplication Re-Factoring

Answer: (Page 142)

Example: Let us consider a very simple example. The refactoring involved in this case is known as "Consolidate Duplicate Conditional Fragments". As the name suggests, this refactoring lets the programmer improve the quality of the code by grouping together the duplicate code, resulting in less maintenance afterwards.

```
if (isSpecialDeal()) {

total = price * 0.95;

send ();

}

else {

total = price * 0.98;

send ();

}
```

In this case, *send* is being called from different places. We can consolidate as follows:

```
if (isSpecialDeal())

total = price * 0.95;

else

total = price * 0.98;

send ();
```

It can further be improved if we calculate total outside the if statement as shown below.

```
if (isSpecialDeal())
```

factor = 0.95;

else

factor = 0.98;

total = price * factor;

send ();

Although this is a trivial example, it nevertheless is useful and teaches us how can be consolidate code by grouping together pieces of code from different segments.

Hazard and Mishap by Software Failure

Answer: (Page 117)
Reliability and safety are closely related. Software reliability uses statistical techniques to determine the likelihood that a software failure will occur. Occurrence of a software failure does not necessarily result in a hazard or mishap. On the other hand, software safety examines the ways in which failures result in conditions that can lead to a mishap.

A code was given and we have to re-factor the code by CDCF re-factory method. (5)
Answer: (Page 142)
Let us consider a very simple example. The refactoring involved in this case is known as "Consolidate Duplicate Conditional Fragments". As the name suggests, this refactoring lets the programmer improve the quality of the code by grouping together the duplicate code, resulting in less maintenance afterwards.
```
if (isSpecialDeal()) {
total = price * 0.95;
send ();
}
else {
total = price * 0.98;
send ();
}
```

In this case, send is being called from different places. We can consolidate as follows:

```
if (isSpecialDeal())
total = price * 0.95;
else
total = price * 0.98;
```

send ();

It can further be improved if we calculate total outside the if statement as shown below.

if (isSpecialDeal())
factor = 0.95;
else
factor = 0.98;

total = price * factor;
send ();

Write down the format of compound number that may not used for relapse version. (3)
Answer: (Page 122)

1.0.0

What does the producers and the reviewer play in review meetings? (5)
Answer: (Page 112)
One of the reviewers takes the roles of recorder. Producer walks through the product, explaining the material while other reviewers raise issues based upon their advanced preparation.

Models of CMMI
Answer: (Page168)
CMMI models: staged and continuous. The organization and presentation of the data are different in each representation. However, the content is the same.

Is requirement errors costly to fix it
Answer: (Page127)
Yes requirement errors are costly to fix. Requirement errors are listed as one of the roots causes of software project failure.

Problems hazard
Answer: (Page 117)
Once hazards are identified and analyzed, safety-related requirements can be specified for the software.

Requirement traceability

Answer: (Page133)

Requirement traceability is a very important consideration for requirement management.

It is really hard to manage requirements that are not traceable. It is important to trace requirements both ways. That is from origin of a requirement to how it is implemented. This is a continuous process.

Comparison of staged and continuous

Answer: (Page170)

Staged

• Process improvement is measured using maturity levels.

• Maturity level is the degree of process improvement across a predefined set of process areas.

• Organizational maturity pertains to the "maturity" of a set of processes across an organization

Continuous

• Process improvement is measured using capability levels.

• Capability level is the achievement of process improvement within an individual process area.

• Process area capability pertains to the "maturity" of a particular process across an organization.

What type of information used in CCB

Answer: (Page 124)

Whenever a change is required, the CCB decides whether to allow this change to happen or deny it.

Requirement id or requirement status k 2 advantages as a attributes of requirements

Answer: (Page 129)

Requirement id:

Requirement ID is the unique number or collection of letters and number used to identify a specific requirement.

Requirement status:

It can be used to keep track of different requirements going through different phases. The possible status values are proposed, approved, implemented, verified, and deleted.

If SCM is not its proper place then is a disadvantage

OR

Software development organization if they are not having SCM.(5)

Answer: (Page 119)

SCM is one of the five KPA required for an organization to be at CMM level 2. That meAnswer, according to SEI, effective project management is not possible without having a proper SCM function in place.

Comments in bad smell

Answer: (Page144)

- Comments are sometimes used to hide bad code
- "…comments often are used as a deodorant" (!)

Re-factor the given program.

if (isSpecialDeal())
total = price * 0.95;
else
total = price * 0.98;
send ();

Answer: (Page 142)

if (isSpecialDeal()) factor = 0.95;
else

factor = 0.98;

total = price * factor;
send ();

What is software refactoring?

Answer: (Page142)

Software refactoring is the process of changing a software system such that the external behavior of the system does not change while the internal structure of sometimes called "Improving the design after it has been written".

What is software safety?

Answer: (Page 117)

Software Safety is a software SQA activity that focuses on identification of potential hazards that may affect software negatively an conducted as part of software safety and hazards are identified and categorized by criticality and risk.

Uses of time boxing

Time-boxing scheduling technique. Do you think that this technique can ensure the delivery of product according to the deadline.(5 marks)

Answer: (Page 105)

Time-boxing is used in severe deadline pressure. It is a use incremental strategy where tasks associated with each increment are time-boxed in the following manner:

• Schedule for each task is adjusted by working backward from the delivery date.
• A box is put around each task
• When a task hits the boundary of the box, work stops and next task begins
The principle behind time-boxing is the 90-10 rule (similar to Pareto Principle) - rather than becoming stuck on the 10% of a task, the product proceeds towards the delivery date in 90% of the cases

Difference between check-in and check-out?

Answer: (Page 123)

The difference between check in and check out is that when a change is needed in an object than it is checked out on that time it is locked so that no other change has been done than the object is again incorporated to the project this process is called checked in. At the same time the object is unlocked again.

What should be included in software tracking?

Answer: (Page 102)

A schedule is meaningless if it is not followed and tracked. Tasks and milestones defined in a project schedule must be tracked and controlled as project proceeds. Tracking
methods include:
• Periodic project status meetings
• Evaluating the results of all reviews
• Determine whether project milestones have been accomplished by the scheduled date
• Comparing actual start date to planned start date
• Informal meetings with the practitioners
• Using earned value analysis
• Error tracking

Hazards associated with the associated with a computer-based cruise control for an automobile?
Answer: (Page 117)
• Causes uncontrolled acceleration that cannot be stopped
• Does not respond to depression of brake pedal
• Does not engage when switch is activated
• Slowly loses or gains speed

Risks involve in migration of legacy systems.
Answer: (Page 135)
Legacy system migration however is not an easy task and there are a number of risks involved that need to be mitigated. First of all, there is rarely a complete specification of the system available. Therefore, there is no straight forward way of specifying the services provided by a legacy system. Thus, important business rules are often embedded in the software and may not be documented elsewhere. Business processes and the way legacy systems operate are often intertwined. New software development may take several years.
New software development is itself risky as changes to one part of the system inevitably involve further changes to other components.

What problem can be caused by the following bad smells?
• Large classes
• Shotgun surgery
Answer: (Page 143)
Large classes try to do too much, which reduces cohesion
Shotgun strategy - a change requires lots of little changes in a lot of different classes

What does mean by the term "Software Reengineering"?
Answer: (Page 138)
Software solutions often automate the business processes. In many cases, the software makes the business processes. As these rules and processes change, the software must also change. A time comes when these changes become Very difficult to handle. So reengineering is re-implementing legacy systems to make them more maintainable. It is a long term activity.

How can quality of design is measured quantitatively?
Answer: (Page 114)
Statistical SQA is a technique that measures the quality in a quantitative fashion. It implies that information about defects is collected and categorized and an attempt is made to trace each defect to underlying cause. It uses Pareto Principle to identify (80% of defects can be traced to 20% of causes) and moves to correct the problems that have caused the defects.

Subtasks have interdependencies based on their sequence; Give an example of subtask interdependencies?
OR
Describe interdependencies of process with example? 2

Answer: (Page 92)

The interdependency of each compartmentalized activity or task must be determined. Some tasks must occur in sequence while others can occur in parallel. Some activities cannot commence until the work product produced by another is available.

What is the difference between code and design restricting?
Answer: (Page 139)
Program is restructured after the reverse engineering phase. In this case we modify source code and data in order to make data restructuring. Code restructuring requires redesign with same function with higher quality than original program and data restructuring involves restructuring the database or the database schema. It may also involve code restructuring.

Give some recommendation to make a Walkthrough to be effective?
Answer: (Page 112)
FTRs are usually conducted in a meeting that is successful only if it is properly planned, controlled, and attended. The producer informs the PM that the WP is ready and the review is needed. The review meeting consists of 3-5 people and advanced preparation is required. It is important that this preparation should not require more than 2 hours of work per person. It should focus on specific (and small) part of the overall software.

If spoilage is decreasing then what effect on maintainability.
Answer: (Page 68)
It is defined as the cost to correct defects encountered after the software has been released to the users. If its value is decreasing then the maintainability will be increase.

Business risks

Answer: (Page 86)
- Marketability
- Alignment with the overall business strategy
- How to sell
- Losing budget or personnel commitments

Do you think Flexibility and maintainability is same thing. Tell reason?
Answer: (Page 68)
Maintainability
- Effort required to locate and fix an error in a program
• Flexibility
- Effort required to modify an operational program

Occurrence of software failure does not necessary result in a hazard or mishap do u agree or not (3 marks)
Answer: (Page117)
Yes, Occurrence of a software failure does not necessarily result in a hazard or mishap.

Do you think that a long parameter list of function /method can b bad smell? (3 Marks)
Answer: (Page 143)
Long Parameter List can be a bad small as it is hard to understand, can become inconsistent.

Whenever a change is required the ccb decided that a change is needed an engineering change or ECO generated what type of information is depicted by this eco (5 Marks)

Answer: (Page124)
An ECO defines the change to be made, the constraints that must be respected, and the criteria for review and audit.

Advantages of Poka-Yoke.

Answer: (Page 118)

Poka-yoke is a QA technique developed. Poka-yoke devices are mechanisms that lead to prevention of potential quality problem before it occurs or the rapid detection of quality problems if they are introduced.

Do you think that being unable to follow a specified standard is also a risk? Provide reason
Answer: (Page 176)
Specified standards define a set of development criteria that guide the manner in which software is engineered. If the criteria are not followed, lack of quality will almost surely result.

Mention the situation, when you think that is appropriate to continuo maintaining the existing legacy system instead of switching to new system.

OR

On what basis, a legacy system is assessed that whether it should be maintained or discarded. Explain it briefly.

Answer: (Page 135)

We need to assess a legacy system before a decision for migration is made.

Legacy System Assessment
For each legacy system, there are four strategic options:
1. Scrap the system completely: This is the case when system is not making an effective contribution to business processes and business processes have changed significantly and the organization is no longer completely dependent upon the system.
2. Continue maintaining the system: This option is used when system is still required, it is stable, and requirements are not changing frequently.
3. Transform the system in some way to improve its maintainability: this option is exercised when system quality has been degraded and regular changes to the system are required.
4. Replace the system with a new system: this path is taken when old system cannot continue in operation and off- the shelf alternative is available or system can be developed at a reasonable cost.

Components of legacy system

Answer: (Page 134)

A legacy system has many components. These include business processes, business rules, application software, application data, support software, and system hardware.

Differentiate between software Reengineering Process model and Business Process reengineering? 3 mark

Answer: (Page 138)

Software Reengineering Process Model
The software reengineering is a non-trivial activity. Just like legacy migration, careful analysis must be carried out before a decision for reengineering is taken.

Business Process Reengineering

A concept similar to software reengineering is of business process reengineering (BPR). A business process is "a set of logically related tasks performed to achieve a defined business outcome". It is the way certain business is conducted. Purchasing services and supplies, hiring new employees, paying suppliers are examples of business processes.

Characteristic of a Poka-yoke device? 3 mark

Answer: (Page 118)

• It is simple and cheap
• It is part of the process

• It is located near the process task where the mistake occurs

Give Some Recommendations for effective walkthroughs? 5 mark

Answer: (Page 112)

FTRs are usually conducted in a meeting that is successful only if it is properly planned, controlled, and attended. The producer informs the PM that the WP is ready and the review is needed. The review meeting consists of 3-5 people and advanced preparation is required. It is important that this preparation should not require more than 2 hours of work per person. It should focus on specific (and small) part of the overall software. For example, instead of the entire design, walkthroughs are conducted for each component, or small group of components. By narrowing focus, FTR has a high probability of uncovering errors.

It is important to remember that the focus is on a work product for which the producer of the WP asks the project leader for review. Project leader informs the review leader. The review leader evaluates the WP for readiness and if satisfied generates copies of review material and distributes to reviewers for advanced preparation. The agenda is also prepared by the review leader.

Give Some Recommendations for effective Review? 5 mark

Answer: (Page 113)

This can be achieved by setting an agenda and maintaining it. In order to do so, the review team should:

· Avoid drift
• Limit debate and rebuttal
• Enunciate problem areas but don't try to solve all problems
• Take written notes
• Limit the number of participants and insist upon advanced preparation
• Develop a checklist for each product that is likely to be reviewed
• Allocate resources and schedule time for FTRs
• Conduct meaningful training for all reviewers
• Review your early reviews
• Determine what approach works best for you

Explain SQA Group Activities? 3 mark

Answer: (Page 177)

An SQA plan is developed for the project during project planning and is reviewed by all stake holders. The plan includes the identification of:

• Evaluations to be performed
• Audits and reviewed to be performed
• Standards that are applicable to the project
• Procedures for error reporting and tracking
• Documents to be produced by the SQA group

• Amount of feedback provided to the software project team

The group participates in the development of the project's software process description.
The software team selects the process and SQA group reviews the process description for compliance with the organizational policies, internal software standards, externally imposed standards, and other parts of the software project plan.

What should be included in software tracking methods?
Answer: (Page 102)
Tracking methods include:
• Periodic project status meetings
• Evaluating the results of all reviews
• Determine whether project milestones have been accomplished by the scheduled date
• Comparing actual start date to planned start date
• Informal meetings with the practitioners
• Using earned value analysis
• Error tracking

Working of check-in and check-out processes
Answer: (Page 124)
In SCM, the processes of Check-in and Check-out take a central stage. These are two important elements of change control and provide access and synchronization control.
Access control manages who has the authority to check-out the object and synchronization control ensures that parallel changes by two different people do not overwrite one another.

How can we calculate notion of availability in statistical measurement?
Answer: (Page 116)
Availability = (MTTF/MTBF) x 100

And clearly depends upon MTTR.

What is meant by 90-10% rule in time-boxing?
Answer: (Page 105)
The principle behind time-boxing is the 90-10 rule (similar to Pareto Principle) – rather than becoming stuck on the 10% of a task, the product proceeds towards the delivery date in 90% of the cases.

What would this model depict?
Errors from
previous step

Answer: (Page 110)
This model depicts that each development step inherits certain errors from the previous step. Some of these errors are just passed through to the next step while some are worked on and hence are amplified with a ratio of 1: x. In addition, each step may also generate some new errors. If each step has some mechanism for error detection, some of these errors may be detected and removed and the rest are passed on to the next step.

What is the guideline for organizations so that they will not depend on single individuals for their growth?

Answer: (Page 26)
Every phase must be fully documented before starting the next phase. It is important to note that postponed documentation may never be completed as the responsible individual may leave. Documentation is important as the product is constantly changing–we need the documentation to do this. The design (for example) will be modified during development, but the original designers may not be available to document it.

In a human resource application, information of an employee is added by entering some general information. In addition to general informations, the employee is salaried or hourly employee. The user has determined that an employee must be either salaried or hourly. Either type has information about dependencies. Identify the RET in above situation.
Answer: (Page 46)
There are three subgroups or RETs as shown below:
· Salaried employee (mandatory); includes general information
· Hourly employee (mandatory); includes general information
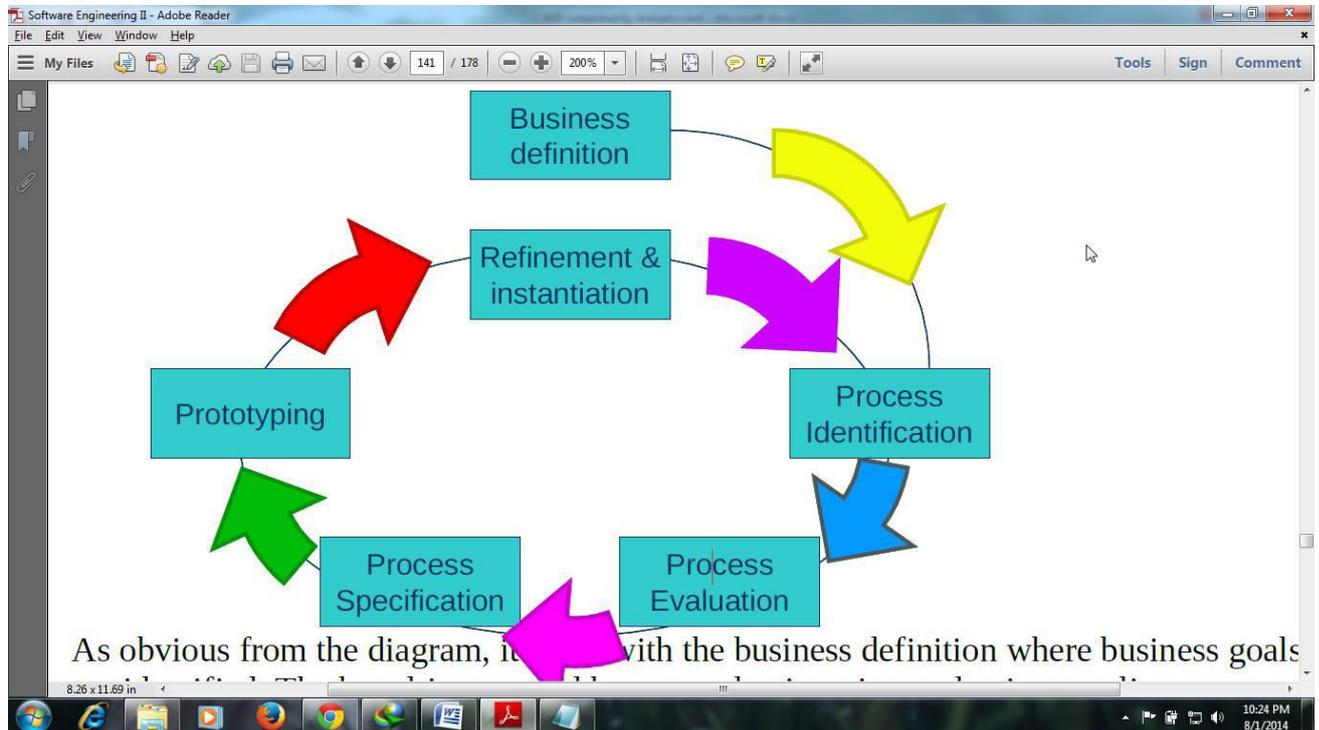· Dependent (optional)

What are the step of BPR (5 marks)

Answer:- (Page 141)

Business process reengineering (BPR)

As obvious from the diagram,
it starts with the business definition where business goalsare identified. The key drivers could be cost reduction, time reduction, quality improvement, and personnel development and empowerment. It may be defined at the business level or for a specific component of the business.

The next step is process identification. At this time processes that are critical to achieving the goals are identified and are ranked by importance, and need for change.The short listed processes are then evaluated. Existing process is analyzed and measured and process tasks are identified. The cost and time consumed is measured as well as the quality and performance problems are identified.

Then, process specification and design is carried out. Use cases are prepared for each process to be redesigned and a new set of tasks are designed for the processes and then they are prototyped.

A redesigned business process must be prototyped before it is fully integrated into the business. Based on the feedback the business process is refined.

Error tracking Example

Answer: (Page)

• E_{req} for the current project = 2.1

• Organizational average = 3.6

– Two possibilities

• The team has done an outstanding job

• The team has been lax in its review approach

– If the second scenario appears likely

• Build additional design time

This can also be used to better target review and/or testing resources in the following manner:

– 120 components

– 32 exhibit E_{design} > 1.2 average

– Adjust code review resources accordingly

How maintenance important what its role in quality... 5 marks

Answer: (Page)

Operation and Maintenance: Normally this is the longest phase of the software life cycle. The system is installed and put into practical use. Maintenance involves correcting errors which were not discovered in earlier stages of the life-cycle, improving the implementation of system units and enhancing the system's services as new requirements are discovered.

How refinement important wht its role in project schedule ... 2 marks

Answer: (Page)

A redesigned business process must be prototyped before it is fully integrated into the business. Based on the feedback the business process is refined.

From 1979 to 1984 continued statistical analysis was performed on the method and refinements were made. At that point, a non-profit organization by the name of International Function Point User Group (IFPUG) was formed which formally took onto itself the role of refining and defining the counting rules. The result is the function point methodology that we use today.

Usage of FP includes:
· Effort Scope Estimation
· Project Planning

· Determine the impact of additional or changed requirements
· Resource Planning/Allocation
· Benchmarking and target setting
· Contract Negotiations

During the Formal Technical Review (FTR) meeting, the recorder notes all the issues. They are summarized at the end and a review issue list is prepared. List down any three points (3 marks)

 Answer: (Page)
During the FTR the recorder notes all the issues. They are summarized at the end and a review issue list is prepared. A summary report is produced that includes:
• What is reviewed?
• Who reviewed it?
• What were the findings and conclusions?
It then becomes part of project historical record.

Analysis techniques such as fault tree analysis can be used to predict the chain of events that can cause hazards. Yes or No? 2 marks

 Answer: (Page)
Yes, Analysis techniques such as fault tree analysis can be used to predict the chain of events that can cause hazards and the probability that each of these events will occur to create the chain.

What is the advantage of network task/task network? 3 mark

 Answer: (Page)
Once the tasks have been identified, we need to develop a task network to determine the sequence in which these activities need to be performed. This will ultimately lead to the time required to complete the project (to be discussed later).

Parameters for assessing the "application software" component of a legacy system.(2 marks)
 Answer: (Page)
Understandability, Documentation, Data, Programming Language, Test Data, Personnel skills.

 One advantage of re-engineering a legacy system.(2 marks)
 Answer: (Page)
Re-engineering is re-implementing legacy systems to make them more maintainable.

If we have collected the historical data of our organization, how the data related to errors help in assessing the quality of the present project?(3 marks)
Answer: (Page)

Software project management primarily deals with metrics related to productivity and quality. For planning and estimation purposes, we look at the historic data – productivity of our team and the quality of their deliverables in the past projects. This data from the previous efforts is used to determine and estimate the effort required in our current project to deliver a product with a predictable quality. This data is also used to analyze the system bottlenecks and helps us in improving the productivity of our team and the quality of our product.

Earned value analysis ?

Answer: (Page)
Earned Value Analysis or EVA is a quantitative technique for assessing the progress of a project. The earned value system provides a common value scale for every software task, regardless of the type of work being performed. The total hours to do the whole project are estimated, and every task is given an earned value based on the estimated percentage of the total. In order to do the EVA, the budgeted cost of work schedule (BCWS) is determined as follows:
Let

$BCWS_i$ = effort (person-days etc) for task$i$

BCWS is then the Progress so far – add all BCWSi so far.

Identify staged CMMI from following? 2

Answer: (Page)
Software CMM, Software Acquisition CMM, People CMM

Benefit of continuous representation in Pakistan's small organization? 5

Answer: (Page)
Organization can focus on their own areas of expertise and may be able to achieve high capability levels in some areas without bothering about the rest. This is a great advantage for small organization and hence this model is believed to be more suitable for small Pakistani organizations than the staged one.

Software re-engineering model components name only? 5

Answer: (Page)
Inventory analysis,

Document restructuring,

Reverse engineering,

Program Restructuring (Code Restructuring, Data Restructuring),

Forward Engineering,

If organization not following SCM what are impacts on that organization only two?5

Answer: (Page)
Although applying systems engineering techniques on a project doesn't guarantee success, not following SCM approach is a strong recipe for failure.

SCM is an approach to building systems that enhances the quality of the end result and without SCM we cannot make those projects more effective in developing and implementing the systems they are intended to build.

Mention the situation, when you think that it is appropriate to continue maintaining the existing legacy system, instead of switching to some new system(3 marks)
Answer: (Page)

Give the types of Reviews with an example.
Answer: (Page)
There are many types of reviews. In general they can be categorized into two main categories namely informal and formal technical reviews. Formal Technical reviews are sometimes called as walkthroughs or inspections. They are the most effective filter from QA standpoint.

Importance of reviews
Answer: (Page)
Technical work needs reviewing for the same reason that pencils needs erasers: To err is human. The second reason that we need technical reviews is although that people are good at catching errors, large class of errors escape the originator more easily than they escape anyone else. Freedman defines a review – any review – as a way of using the diversity of a group of people to:
• Point out needed improvements in the product of a single person or team

• Confirm those parts of a product in which improvement is either not desired or no needed
• Achieve technical work of more uniform, or at least more predictable, quality than can be achieved without reviews, in order to make technical work more manageable.
Reviews help the development team in improving the defect removal

What measurements we can take in change activity during a project?
 Answer: (Page)

 In this regards, the following could be measured

· The number of change requests received, open, and closed

· The cumulative number of changes made including added, deleted, and modifie requirements

· The number of change requests that originated from each source

· The number of changes proposed and made in each requirement since it was baselined

· The total effort devoted to handling changes

These can then be plotted as shown in the graphs below to get an idea of the stability of the systems. It is important to note that the sooner the requirements come to a stable state after establishing the baseline the better it is for the project. It is also useful to track the source of the requirement changes so that processes governing those areas causing more frequent changes may be strengthened in future projects.

Write down the levels of Capability Maturity Model (starting from 0-5).
 Answer: (Page)
5 Optimizing
4 Quantitatively Managed
3 Defined
2 Managed
1 Performed
0 Incomplete

Comment on the following statement regarding reviews
"No review is better than an un-controlled review"
 Answer: (Page)
It is actually one of Review Guidelines It is essential to note that an uncontrolled review can be worse than no review.
The basis principle is that the review should focus on the product and not the producer so that it does not become personal. Remember to be sensitive to personal egos. Errors should be pointed out gently and the tone should be loose and constructive.

With respect to Version Controlling in SCM; what is the difference between Product update and Product upgrades?
Answer: (Page)
Version Control is one of Software Configuration Management Tasks.
 An update fixes product defects.
An upgrade enhances the product feature set and will include updates.

Explain the process model for Business Process Reengineering (BPR) either pictorially or in writing. (Just give the steps that are conducted in BPR)
Answer: (Page)

Business definition
Process Identification
Process Evaluation
Process Specification
 Prototyping
Refinement & instantiation

What are the difficulties in maintaining the Legacy System?
Answer: (Page)

 Maintaining legacy system is expensive. It is often the case that different parts of the system have been implemented by different teams, lacking consistency. Part or all of the system may be implemented using an obsolete language. In most cases system documentation is inadequate and out of date. In some cases the only documentation is the source code. In some cases even the source code is not available.

Many years of maintenance have usually corrupted the system structure, making it increasingly difficult to understand. The data processed by the system may be maintained in different files which have incompatible structures. There may be data duplication and the documentation of the data itself may be out of date, inaccurate, and incomplete.

As far as the system hardware is concerned, the hardware platform may be outdated and is hard to maintain. In many cases, the legacy systems have been written for mainframe hardware which is no longer available, expensive to maintain, and not be compatible with current organizational IT purchasing policies.

Support software includes OS, database, and compiler etc. Like hardware, it may be obsolete and no longer supported by the vendors.

A time therefore comes when an organization has to make this decision whether to keep the old legacy system or to move it to new platform and environment. Moving it to new environment is known as legacy system migration.

Software configuration management is a design activity, Give your answer yes or no. support your answer with reason. 3 marks
Answer: (Page)

No. Software configuration management (SCM) is not a design activity

As we now that SOFTWARE CONFIGURATION MANAGEMENT ACTIVITIES
Configuration Identification,
Specification Identification, Size and scope of each *Configuration Item*
language dependencies, testing issues, documentation concerns, design constraints, life cycle cost and schedule, change control, intended usage, support equipment/software (off the shelf software) and classification.
By above activities we can say that Software configuration management (SCM) much activity including design activity.

How application needs to upgrade in legacy system? 2 marks
Answer: (Page)

Support software includes OS, database, and compiler etc. Like hardware, it may be

obsolete and no longer supported by the vendors.

Forward engineering do not allow adding new method, concept and principle. Agree or not? 3
Answer: (Page)

Forward engineering requires application of SE principles, methods, and concepts to re-create an existing application.

Is it necessary to give separate number to each release of software?
Answer: (Page)

Software hanged at client side and worked well in office of developer's firm. What is the reason.
Answer: (Page)

Is poke yoke used in project planning?
Answer: (Page)

Scenario of aircraft traffic control system was given and as a project manager what requirement is applied here and why?

Answer: (Page)

On ECG machine, Use Poka-Yoka Technique for mistake proofing during ECG test?

Answer: (Page)

In"state-of-the-art" technology may increase the productivity of the team and quality of the product it may prove to be unstable and hence prove to be difficult to handle agree or not?

Answer: (Page)