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**SUGGESTED SOLUTION**  
**CA FINAL NOVEMBER 2016 EXAM**

**ISCA**

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**BRANCH - (MULTIPLE)**

**Head Office : Shraddha, 3<sup>rd</sup> Floor, Near Chinai College, Andheri (E), Mumbai – 69.**

**Tel : (022) 26836666**

**Answer-1 :**

- (a) Three major attributes of information security are given as follows:
1. Confidentiality: It refers to the prevention of unauthorized disclosure of information.
  2. Integrity: It refers to the prevention of unauthorized modification of information.
  3. Availability: It refers to the prevention of unauthorized withholding of information. The proposed Knowledge Portal aims to provide the access of various academic resources on anytime anywhere basis. Hence, out of these aforementioned attributes, the third attribute namely, availability will be having the highest priority while developing web based knowledge portal. **(4 Marks)**
- (b) The possible dimensions under which the feasibility study of the proposed Knowledge Portal was done are given as follows:
1. Technical: Is the technology needed to build and run the portal available? **(1 Mark)**
  2. Financial: Is the solution financially viable? (e.g. revenue from new course vis-à-vis reduction in cost of classrooms / new cost of developing and running portal ) **(1 Mark)**
  3. Economic: What is the Return on Investment? **(0.5 Mark)**
  4. Schedule/Time: Can the system be delivered on time? (e.g. before start of the new academic year) **(1 Mark)**
  5. Resources: Are human resources (faculty) available to develop the solution or are they reluctant to use it? **(1 Mark)**
  6. Operational: How will the solution work? **(0.5 Mark)**
  7. Behavioral: Is the solution going to bring any adverse or positive effect on quality of work life? (e.g. enable students to pursue studies at their own time and from their own place of stay without having to be on campus; effect on students / their study due to non-interaction with other students and faculty) **(2 Marks)**
  8. Legal: Is the solution valid in legal terms? E.g. considering the requirements specified by University regulators like UGC – University Grants Commission **(1 Mark)**
- (c) Major validation methods of validating the vendors' proposal for developing the Knowledge Portal are given as follows:
1. Checklists: It is the most simple and rather subjective method for validation and evaluation. The various criteria are put into check lists in the form of suitable questions against which the responses of the various vendors are validated. For example : Support Service Checklists may have parameters like – Performance, System development, Maintenance, Conversion, Training, Back-up, Proximity, Hardware, Software. **(1.5 Marks)**
  2. Point-Scoring Analysis: Point-scoring analysis provides an objective means of selecting the final system. There are no absolute rules in the selection process, only guidelines for matching user needs with software capabilities. Evaluators must consider such issues as the University's needs to operate and maintain the portal, vendor reputations, software costs, user-friendliness for students (who are the customers in this case), and so forth. **(1.5 Marks)**
  3. Public Evaluation Reports: Several consultancy agencies compare and contrast the hardware and software performance for various manufacturers and publish their reports in this regard. This method has been frequently and usefully employed by several buyers in the past. For those criteria where published reports are not available, however, resort would have to be made to other methods of validation. This method is particularly useful where the buying staff has inadequate knowledge of facts. E.g. Public reports by agencies like Gartner's magic quadrant on systems used by other universities offering online courses may be considered **(2 Marks)**
  4. Benchmarking Problem for Vendor's Proposals: Benchmarking problems for vendors' proposals are sample programs that represent at least a part of the buyer's primary computer work load and include software considerations and can be current applications programs or new programs that have been designed to represent planned processing needs. E.g. develop a set of sample requirements of a student and see whether the proposed system is able to effectively and efficiently deliver them. That is, benchmarking problems are oriented towards testing whether a computer system offered by the vendor meets the requirements of the buyer. **(1.5 Marks)**

5. Test Problems: Test problems disregard the actual job mix and are devised to test the true capabilities of the hardware, software or system. For example, test problems may be developed to evaluate the time required to download e-lectures (which are large sized files) by students, response time when large number of students login in at the same time, overhead requirements of the operating system in executing multiple user requests, length of time required to execute an instruction, etc. The results, achieved by the machine can be compared and price performance judgment can be made. It must be borne in mind, however that various capabilities to be tested would have to be assigned relative weightage as all requirements may not be equally important **(1.5 Marks)**

**Answer-2 (a)**

Communication Controls: Communication Controls maintain a chronology of the events from the time a sender dispatches a message to the time a receiver obtains the message. **(1 Mark)**

Accounting Audit Trail

1. Unique identifier of the source/sink node **(0.5 Mark)**
2. Unique identifier of each node in the network that traverses the message; Unique identifier of the person or process authorizing dispatch of the message; Time and date at which the message was dispatched; **(1 Mark)**
3. Time and date at which the message was received by the sink node; **(1 Mark)**
4. Time and date at which node in the network was traversed by the message; and **(1 Mark)**
5. Message sequence number; and the image of the message received at each node traversed in the network. **(1 Mark)**

Operations Audit Trail

1. Number of messages that have traversed each link and each node; **(0.5 Mark)**
2. Queue lengths at each node; Number of errors occurring on each link or at each node; Number of retransmissions that have occurred across each link; Log of errors to identify locations and patterns of errors; **(1 Mark)**
3. Log of system restarts; and **(0.5 Mark)**
4. Message transit times between nodes and at nodes. **(0.5 Mark)**

**Answer-2 (b)**

Some of the major ways of protecting the installation against power spikes as follows

1. Water Detectors: These should be placed under the raised floor, near drain holes and near any unattended equipment storage facilities **(1 Mark)**
2. Strategically Locating the Computer Room: To reduce the risk of flooding, the computer room should not be located in the basement or ground floor of a multi-storey building. Studies reveal that the computer room located in the top floors is less prone to the risk of fire, smoke and water. **(1 Mark)**
3. Wherever possible have waterproof ceilings, walls and floors; **(0.5 Mark)**
4. Ensure an adequate positive drainage system exists; **(0.5 Mark)**
5. Install alarms at strategic points within the installation **(0.5 Mark)**
6. In flood areas have the installation above the upper floors but not at the top floor **(0.5 Mark)**
7. Water proofing; and **(0.5 Mark)**
8. Water leakage Alarms **(0.5 Mark)**

**Answer-2 (c)**

Controls are basically designed to reduce the probability of threats, which can exploit the vulnerabilities of an asset and cause a loss to that asset. While designing the appropriate control one thing should be kept in mind - "The cost of the lock should not be more than the cost of the assets it protects." **(2 Marks)**

Sometimes, while designing and implementing controls, organizations because of different constraints like financial, administrative or operational, may not be able to implement appropriate controls. In such a scenario, there should be adequate compensatory measures, which may although not be as efficient as the appropriate control, but reduce the probability of loss to the assets. Such measures are called compensatory controls.

**(1 Mark)**

**Answer-3 (a)**

Some of the weaknesses identified by the experts and practitioners in the Prototyping Model include the following:

1. Approval process and control are not strict. **(1 Mark)**
2. Incomplete or inadequate problem analysis may occur whereby only the most obvious and superficial needs will be addressed, resulting in current inefficient practices being easily built into the new system **(1 Mark)**
3. Requirements may frequently change significantly. **(1 Mark)**
4. Identification of non-functional elements is difficult to document. **(1 Mark)**
5. Designers may prototype too quickly, without sufficient upfront user needs analysis, resulting in an inflexible design with narrow focus that limits future system potential **(1 Mark)**
6. Prototype may not have sufficient checks and balances incorporated **(1 Mark)**
7. Prototyping can only be successful if the system users are willing to devote significant time in experimenting with the prototype and provide the system developers with change suggestions. The users may not be able or willing to spend the amount of time required under the prototyping approach. **(1 Mark)**
8. The interactive process of prototyping causes the prototype to be experimented with quite extensively. Because of this, the system developers are frequently tempted to minimize the testing and documentation process of the ultimately approved information system. Inadequate testing can make the approved system error-prone, and inadequate documentation makes this system difficult to maintain **(1 Mark)**
9. Prototyping may cause behavioral problems with system users. These problems include dissatisfaction by users if system developers are unable to meet all user demands for improvements as well as dissatisfaction and impatience by users when they have to go through too many interactions of the prototype. **(1 Mark)**

**Answer-3 (b)**

Following are the major misconceptions about MIS

- Any computer based information system is a MIS.
- Any reporting system is MIS.
- MIS is a management technique.
- MIS is a bunch of technologies.
- MIS is an implementation of organizational systems and procedures. It is a file structure.
- The study of MIS is about use of computers. A MIS may or may not be computer based. Use of computers only makes the system more efficient by reducing response time.
- More data in generated reports refers more information to managers. It is not the quantity of data but its relevance which is important for decision making.
- Accuracy plays vital role in reporting. Accuracy is relevant but not an absolute ideal. Higher accuracy involves higher cost. At operational level accuracy is required but normally at the top management level a fairly correct presentation of relevant data is more often adequate

**(4 Marks)**

**Answer-3 (c)**

The IT Infrastructure Library (ITIL) is a set of practices for IT Service Management (ITSM) that focuses on aligning IT services with the needs of business. In its current form (known as ITILv3 and ITIL 2011 edition), ITIL is published in a series of five core publications, each of which covers an ITSM lifecycle stage. ITIL describes procedures, tasks and checklists that are not organization-specific, used by an organization for establishing a minimum level of competency. It allows the organization to establish a baseline from which it can plan, implement, and measure. It is used to demonstrate compliance and to measure improvement. **(2 Marks)**

Although the UK Government originally created the ITIL, it has rapidly been adopted across the world as the standard for best practice in the provision of information technology services. As IT services become more closely aligned and integrated with the business, ITIL assists in establishing a business management approach and discipline to IT Service Management, stressing the complementary aspects of running IT like a business. Service Management is a set of specialized organizational capabilities for providing value to customers in the form of services. The core of Service Management is transforming resources into valuable services **(2 Marks)**

ITIL V3 represents an important change in best practice approach, transforming ITIL from providing a good service to being the most innovative and best in class. At the same time, the interface between old and new approaches is seamless, making adoption simple for those experienced in ITIL V2. ITIL V3 makes the link between ITIL's best practice and business benefits both clearer and stronger. Based on a core of five titles, the changes in ITIL V3 reflect the way IT Service Management has matured over the past decades and change the relationship between IT and business. Whereas previously ITIL worked to align Service Management with business strategy, ITIL V3 integrates into a single lifecycle **(2 Marks)**

**Answer-4 (a)**

Some of the critical control lacking in a computerized environment are as follows

1. Lack of management understanding of IS risks and related controls; **(1 Mark)**
2. Absence or inadequate IS control framework; **(1 Mark)**
3. Absence of weak general controls and IS controls; **(1 Mark)**
4. Lack of awareness and knowledge of IS risks and controls amongst the business users and even IT staff; **(1 Mark)**
5. Complexity of implementation of controls in distributed computing environments and extended enterprises; **(1 Mark)**
6. Lack of control features or their implementation in highly technology driven environments; and **(1 Mark)**
7. Inappropriate technology implementations or inadequate security functionality in technologies implemented **(2 Marks)**

**Answer-4 (b)**

Auditing physical access requires the auditor to review the physical access risk and controls to form an opinion on the effectiveness of the physical access controls.

This involves the following:

1. Risk assessment: The auditor must satisfy himself that the risk assessment procedure adequately covers periodic and timely assessment of all assets, physical access threats, vulnerabilities of safeguards and exposures there from.
2. Controls assessment: The auditor based on the risk profile evaluates whether the physical access controls are in place and adequate to protect the IS assets against the risks.
3. Planning for review of physical access controls: It requires examination of relevant documentation such as the security policy and procedures, premises plans, building plans, inventory list and cabling diagrams.

**(4 Marks)**

**Answer-4 (c)**

The logic of the program outlined in the flowcharts is converted into program statements or instructions at this stage. For each language, there are specific rules concerning format and syntax. Syntax means vocabulary, punctuation and grammatical rules available in the language manuals that the programmer has to follow strictly and pedantically. Different programmers may write a program using different sets of instructions but each giving the same results **(2 Marks)**

Therefore, the coding standards are defined, which serves as a method of communication between teams, amongst the team members and users, thus working as a good control. Coding standards minimize the system development setbacks due to programmer turnover. Coding standards provide simplicity, interoperability, compatibility, efficient utilization of resources and least processing time. **(2 Marks)**

**Answer-5 (a)**

Section 66A protects users of computer systems and communication devices from these:

- grossly offensive or menacing messages (e.g. threats to life) ;
- spam (unsolicited) mails or messages which cause annoyance, inconvenience, danger, obstruction, insult, injury, criminal intimidation, enmity, hatred, or ill will
- mails which contain information that the sender knows is false ;
- 'phishing' mails which try to deceive or mislead the receiver into thinking that the mail was sent by someone else. Since communication devices are covered, SMS through mobile may also be covered. Contents in attachments to messages are also covered. Contents may be in the form of text, image, audio, video or other form.

The provision prescribes an imprisonment of up to 3 years and fine to person who is convicted of the above offences. **(4 Marks)**

**Answer-5 (b)**

According to COSO, Internal Control is comprised of five interrelated components:

1. Control Environment: For each business process, an organization needs to develop and maintain a control environment including categorizing the criticality and materiality of each business process, plus the owners of the business process.
2. Risk Assessment: Each business process comes with various risks. A control environment must include an assessment of the risks associated with each business process.
3. Control Activities: Control activities must be developed to manage, mitigate, and reduce the risks associated with each business process. It is unrealistic to expect to eliminate risks completely.
4. Information and Communication: Associated with control activities are information and communication systems. These enable an organization to capture and exchange the information needed to conduct, manage, and control its business processes.
5. Monitoring: The internal control process must be continuously monitored with modifications made as warranted by changing conditions. **(6 Marks)**

**Answer-5 (c)**

Audit trails are logs that can be designed to record activity at the system, application, and user level. Audit trails can be used to support security objectives in three ways as described below:

**1. Detecting Unauthorized Access:**

- Detecting unauthorized access can occur in real time or after the fact.
- The primary objective of real-time detection is to protect the system from outsiders who are attempting to breach system controls.
- A real-time audit trail can also be used to report on changes in system performance that may indicate infestation by a virus or worm.
- Depending upon how much activity is being logged and reviewed; real-time detection can impose a significant overhead on the operating system, which can degrade operational performance.
- After-the-fact detection logs can be stored electronically and reviewed periodically or as needed. When properly designed, they can be used to determine if unauthorized access was accomplished, or attempted and failed. **(3 Marks)**

**2. Reconstructing Events:**

- Audit analysis can be used to reconstruct the steps that led to events such as system failures, security violations by individuals, or application processing errors.
- Knowledge of the conditions that existed at the time of a system failure can be used to assign responsibility and to avoid similar situations in the future.
- Audit trail analysis also plays an important role in accounting control. For example, by maintaining a record of all changes to account balances, the audit trail can be used to reconstruct accounting data files that were corrupted by a system failure. **(2 Marks)**

**3. Personal Accountability:**

Audit trails can be used to monitor user activity at the lowest level of detail. This capability is a preventive control that can be used to influence behavior. Individuals are likely to violate an organization's security policy if they know that their actions are not recorded in an audit log. **(1 Mark)**

**Answer-6 (a)**

Once plans are developed, initial tests of the plans are conducted and any necessary modifications to the plans are made based on an analysis of the test results. Specific activities of this phase include the following:

1. Defining the test purpose/approach; **(0.5 Mark)**
2. Identifying test teams; **(0.5 Mark)**
3. Structuring the test; **(0.5 Mark)**
4. Conducting the test; **(0.5 Mark)**

5. Analyzing test results; and **(0.5 Mark)**
6. Modifying the plans as appropriate. **(0.5 Mark)**

The approach taken to test the plans depends in large part, on the recovery strategies selected to meet the recovery requirements of the organization. As the recovery strategies are defined, specific testing procedures should be developed to ensure that the written plans are comprehensive and accurate. **(1 Mark)**

**Answer-6 (b)**

At the lowest level of management, TPS is an information system that manipulates data from business transactions. Any business activity such as sales, purchase, receipts, payments, production or delivery involves transactions and these transactions are organized and manipulated for generation of information by the TPS.

**Typically, a TPS involves the following activities:**

- Capturing data to organize in files or data bases;
- Processing of files/databases using application software;
- Generating information in the form of reports
- Processing of queries from various quarters of the organization **(2 Marks)**

The salient features of a TPS are:

- Large volume of data - As TPS is transaction oriented it generally consists of large volumes of data. It requires greater storage capacity. **(1 Mark)**
- Automation of basic operations - Any TPS aims at automating the basic operations of a business enterprise and plays a critical role in the day-to-day functioning of the enterprise. Thus, TPS is an important source of up-to-date information regarding the operations in the enterprise **(1 Mark)**
- Benefits are easily measurable - TPS reduces the workload of the people associated with the operations and improves their efficiency by automating some of the operations. Most of these benefits of the TPS are tangible and easily measurable. Therefore, cost benefit analysis regarding the desirability of TPS is easy to conduct. As the benefits from TPS are mainly tangible, the user acceptance is easy to obtain **(1 Mark)**
- Source of input for other systems - TPS is the basic source of internal information for other information systems. Heavy reliance by other information systems on TPS for this purpose makes TPS important for tactical and strategic decisions as well. **(1 Mark)**

**Answer-6 (c)**

Two types of errors can corrupt a data code and cause processing errors. These are transcription and transposition errors, which are as discussed below:

1. Transcription Errors: These fall into three classes:
  - a) Addition errors occur when an extra digit or character is added to the code. For example, inventory item number 83276 is recorded as 832766.
  - b) Truncation errors occur when a digit or character is removed from the end of a code. In this type of error, the inventory item above would be recorded as 8327
  - c) Substitution errors are the replacement of one digit in a code with another. For example, code number 83276 is recorded as 83266. **(2 Marks)**
2. Transposition Errors: There are two types of transposition errors.
  - a) Single transposition errors occur when two adjacent digits are reversed. For instance, 12345 are recorded as 21345.
  - b) Multiple transposition errors occur when nonadjacent digits are transposed. For example, 12345 are recorded as 32154. **(2 Marks)**

Any of these errors can cause serious problems in data processing if they go undetected. For example, a sales order for customer 987654 that is transposed into 897654 will be posted to the wrong customer's account. A similar error in an inventory item code on a purchase order could result in ordering unneeded inventory and failing to order inventory that is needed. These simple errors can severely disrupt operations **(1 Mark)**

**Answer-7 (a)**

Private cloud computing environment resides within the boundaries of an organization and is used exclusively for the organization's benefits. These are also called Internal Clouds or Corporate Clouds. Private Clouds can either be private to the organization and managed by the single organization (On-Premise Private Cloud) or can be managed by third party (Outsourced Private Cloud). They are built primarily by IT departments within enterprises, who seek to optimize utilization of infrastructure resources within the enterprise by provisioning the infrastructure with applications using the concepts of grid and virtualization **(2 Marks)**

Certain characteristics of Private Cloud are as follows:



1. Secure: The private cloud is secure as it is deployed and managed by the organization itself, and hence there is least chance of data being leaked out of the cloud. **(0.5 Mark)**
2. Central Control: As usual, the private cloud is managed by the organization itself, there is no need for the organization to rely on anybody and its controlled by the organization itself **(0.5 Mark)**
3. Weak Service Level Agreements (SLAs): SLAs play a very important role in any cloud service deployment model as they are defined as agreements between the user and the service provider in private cloud. In private cloud, either Formal SLAs do not exist or are weak as it is between the organization and user of the same organization. Thus, high availability and good service may or may not be available **(1 Mark)**

The advantages of Private Cloud include the following:

1. It improves average server utilization; allow usage of low-cost servers and hardware while providing higher efficiencies; thus reducing the costs that a greater number of servers would otherwise entail. **(1 Mark)**
2. It provides a high level of security and privacy to the user. **(0.5 Mark)**
3. It is small in size and controlled and maintained by the organization **(0.5 Mark)**

**Answer-7 (b)**

The eight phases of developing a Business Continuity plan are given as follows:

1. Pre-Planning Activities (Business Continuity Plan Initiation)
2. Vulnerability Assessment and General Definition of Requirements
3. Business Impact Analysis
4. Detailed Definition of Requirements
5. Plan Development
6. Testing Program
7. Maintenance Program
8. Initial Plan Testing and Plan Implementation

**(4 Marks)**

**Answer-7 (c)**

Characteristics of PaaS are as follows:

1. All in One: Most of the PaaS providers offer services like programming languages to develop, test, deploy, host and maintain applications in the same Integrated Development Environment (IDE). **(1 Mark)**
2. Web access to the development platform: PaaS provides web access to the development platform that helps the developers to create, modify, test, and deploy different applications on the same platform. **(1 Mark)**
3. Offline Access: To enable offline development, some of the PaaS providers allow the developer to synchronize their local IDE with the PaaS services. The developers can develop an application locally and deploy it online whenever they are connected to the Internet **(1 Mark)**
4. Built-in Scalability: PaaS services provide built-in scalability to an application that is developed using any particular PaaS. This ensures that the application is capable of handling varying loads efficiently. **(1 Mark)**
5. Collaborative Platform: To enable collaboration among developers, most of the PaaS providers provide tools for project planning and communication. **(1 Mark)**
6. Diverse Client Tools: PaaS providers offer a wide variety of client tools like Web User Interface (UI), Application Programming Interface (API) etc. to help the developers to choose the tool of their choice. **(1 Mark)**