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| **National University of Computer and Emerging Sciences, Lahore Campus** | | | | |
| C:\Users\saif\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\final design.jpg | **Course Name:** | Software Engineering Technologies | **Course Code:** | CS527 |
| **Degree Program:** | MS (Computer Science) | **Semester:** | Spring 2020 |
| **Exam Duration:** | 180 Minutes + 15 Minutes to upload answer sheets (as per instructions) | **Total Marks:** | 50 |
| **Paper Date:** | 29 June 2020 | **Weight** | 45% |
| **Section:** | MCS-2A | **Page(s):** |  |
| **Exam Type:** | FINAL |  |  |
| **Student : Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Roll No.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Section:\_\_\_\_\_\_\_** | | | | |
| **Instruction/Notes:** | * Solution **MUST** be scanned into **ONE multi-page PDF file** and uploaded to the provided location (SLATE). * It is your responsibility that you upload the correct soft file (containing answers). In case an incorrect answer sheet is uploaded, all responsibility lies with the student. * Scanning must be done in good lighting conditions with clear focus. * Read the questions carefully multiple times. Make sure that you answer what is being asked. * **Quality of thoughts/arguments has more weightage** than quantity. So think before attempting each question. * **DO NOT write long paragraphs** rather **use bullet points**, be precise and to-the-point when answering questions. Lengthy answers are not expected. | | | |

**Q1. [10 marks]** You are a Chief Technology Officer at a small-sized Bank. The Bank systems (all IT Infrastructures comprising ~20+ Applications and Databases) are on a Private Cloud (IaaS services only) provided by Vendor X. With COVID19, the bank is facing massive revenue issues and planning to move all Infrastructure to Public Cloud (which could be risky in many aspects). You have multiple vendors bidding for the contract.

1. Identify and list the 5 most import factors you will consider in every vendor proposal/bid and why.
2. Discuss what will be your “Evaluation Criteria” for each one of the 5 factors above.

**Solution**

* **Security**
  + Data and Application Security
    - Vendor Certifications
    - Vendor’s Security Compliance Processes
    - Vendor’s Security history, including breaches and breach protocols
* **Cost per month**
  + Cost Predictability on quarterly basis as business grows
  + Cost Modeling to align with Applications’ Scalability
* **Service Standard**
  + General Service Level Agreements (SLA) including downtime
  + Total and Partial Service unavailability protocols
  + Scheduled and unscheduled outage (penalties be applied to Vendor?)
* **Ease of Development/Deployment**
  + Learning Curve for existing employees
  + Skilled resource availability in market
  + Release Management burdens
* **Portability**
  + The efficiency of a financial institution increases multi-fold when in a cloud environment . By hosting data on cloud,  banks can enjoy benefits like:
    - Disaster recovery
    - Quality control
    - Loss prevention
    - Flexibility and mobility
    - Sustainability

**Q2. [10 marks]** You are a User Experience/User Interface design specialist. You have applied for a job at a company which specializes in UI/UX of websites. They have asked you to develop an operational prototype (in 15 days), implementing an online eLearning portal. All learning content is textual (there is no video tutorials). Potential learners can Sign Up and access courses.

You have been asked to come up with a new UI/UX layout (but not clarified on scope). You do not know about backend technologies that you need to integrate with. You are now meeting the senior technical manager to discuss how you will approach this prototype development. With new and emerging UI technologies such as React JS, Angular JS etc., UI development is not anymore only about the UI layer development and includes solid middle-tier development.

So, you have to work out on following to present your idea on delivery to senior manager

* Which prototype, ‘Mockup’ OR ‘Proof of Concept’ will you adopt and why? Provide reason(s).
* What risks (at least 3-4) in prototype development, you have chosen, exist? How will you mitigate those risks.

**Solution**

1. **Proof of Concept**

**Risks**

* Layout – Since significant work and your evaluation depends on a solid UI/US layout, spend 75% effort on it.
* Refining requirements may take significant time and effort resulting in cost over-runs. Scrum (and scope closure) will help minimize risk.
* UI/UX Technology selection: Cost and maintainability risks. Identify a selection criteria and matrix to evaluate potential technologies before your propose a tool/technology for development.
* No Information on scope of work. You can perform development in Scrum to minimize risk.
* No info on technical integration with existing back-end systems – You need to address this in prototyping phase. Progressively gather requirements and integrate your UI/UX with backend.

**Q3. [15 marks]** You are the Director of Project Management of a software development company, an expert Agile/Scrum Coach and Practitioner yourself. One of the development teams (~7 resources) is engaged in product development on a 10 month project, following ‘Scrum’ methodology (10 X 30 day Sprint Cycles). The development is in 3rd month and is troubled. Personal investigation and analysis by the Director of Project Management has revealed the following situation

1. *Product Owner doesn’t have any experience in Agile methodologies. He used to be a technical architect in Waterfall projects. Therefore User Stories appear more like Waterfall’s technical design artifacts, lacking estimation of work, no mention of requirements’ priority, lacking requirement (not design) details, lack in determining the ‘value’ of work etc.*
2. *Half of the development team has not previously worked in Scrum. Scrum Master is a Sr. technical developer and has been estimating the scope of Sprints for all team members.*
3. *With Covid19 changes, the team is working remote and challenges in communication have led to miscommunicated requirements, lack of clarity on task assignments, incomplete work status updates by team members etc.*
4. *Development team has missed delivery of scope for the last 3 sprints. As a consequence high priority User Stories in the Product Backlog have been growing. Customers are frustrated in ‘Sprint Reviews’ due to missing deadlines and have started losing interest in product already.*

As an expert, you need to manage these issues bringing the product development back on track.

1. Discuss at-least 4 Scrum artifacts/ceremonies/practices (in order of priority) you will review and bring changes to – keeping in mind the above issues.
   * Argue as to why you have chosen these particular artifacts/areas and not others.
   * Discuss the actual improvement/changes, you plan to bring, in the artifacts you have identified.

Provide strong arguments (for above question) supporting your views. Assume you have 3 Sprints (1 month each) cycles to bring back the project on track. So your plan to fix issues should be short term.

**Note:**

* You cannot send one or all team members for training and put the project on partial- or full-hold, as the deadlines do not allow for this.
* Read the question carefully, it does NOT require you to explain what Scrum and its artifacts are. So explaining Scrum theory will not get you any points.

**Solution**

1. (To address issues 1, 2, 4) Engage and coach (on job training) to Product Owner and Development team so to improve the issues identified in problem statement related to User Stories. Also improve upon
   1. Clearly *expressing, ordering and prioritizing* for all Backlog items (User Stories);
   2. User Stories should fulfill all formal requirements before logged into Product Backlog. User Stories should not contain software design details.
   3. Optimizing the *value of the work* the Development Team performs;
   4. Ensuring that the Product Backlog shows what the Scrum Team is currently working and will work on next;
   5. Directly coach the PO and Development team.
2. (To address issue 2 and 4) Mis-Estimation of User Stories, work with coaching Development team on Sprint Planning
   1. Understanding the business requirements specified by the Product Owner, estimating User Stories, and final *creation of the project deliverables*
   2. Ensuring the Development Team understands items in the Product Backlog to the level needed. This will help them determine the Story Point estimation.
   3. Sprint Planning
      1. Sprint Planning answers the following:
         1. What can be delivered in the Increment resulting from the upcoming Sprint?
         2. How will the work needed to deliver the Increment be achieved?
      2. Considers available resources and skillset
      3. ONLY work that can be delivered in a sprint is selected from the Product Backlog and pulled into the Sprint Backlog.
3. (To address item 3) Online Daily Scrum Meeting to address
   1. Team answers 3 questions
      1. What has been done since yesterday
      2. What will be done till tomorrow
      3. What are current issues
   2. Sprint Burndown Chart developed, tracked and shared with team on daily basis.
      1. Is an illustration of the work remaining in a Sprint.
      2. It helps both the team and the Scrum Master as it shows progress on a day-to-day basis
      3. Can *predict* whether the Sprint goal will be achieved on schedule.
4. (Address all items and mainly 4) The Sprint
   1. Ensure team understand that is meant by ‘Done’
   2. Keep a close track on Sprint Burn-down chart on a daily basis.
   3. During the Sprint
      1. No changes are made that would endanger the Sprint Goal;
      2. Quality goals do not decrease; and,
   4. Scope may be clarified and re-negotiated between the Product Owner and Development Team as more is learned.

**Q4. [15 marks]** Assume you have joined a software development company as a project management expert. You are a strong advocate of PMI Practices; however the company doesn’t follow any project management methodology currently.

You are called upon by the senior management for a meeting to discuss what disadvantages/issues the company will potentially face if they don’t follow a formal Project Integration Methodology (as advised by PMI). You need to understand that introducing new processes will incur more costs (skilled human resource, training, time etc.) and without strong arguments the senior management will NOT buy your advice. Identify and provide strong arguments on 2 most important disadvantages the company will face and how they will impact project success - for each of the areas below, if PMI practices are NOT followed.

* Develop Project Charter
* Develop Project Management Plan
* Monitor and Control Project Work
* Integrated Change Control

**Solution**

* 1. **Develop Project Charter**
     1. Project purpose or justification
        1. Without project justification in terms of Cost Vs. benefits, low-benefit high-cost projects can be selected for implementation.
     2. Measurable project objectives and related success criteria
        1. Absence of project objectives will lead to undefined scope of work. Help project team understand scope of work, so not to work towards out of scope items.
        2. Missing success criteria will disable project team understand defined and measureable success.
  2. **Develop Project Management Plan**
     1. You are setting baselines for all project management knowledge areas (scope, time, cost etc.).
     2. No breakdown of deliverables (WBS etc.) in manageable pieces

If i and ii above, not done there will be

* + - 1. No information on baselines
      2. No measurement strategy for all knowledge areas as project progresses
      3. No project tracking mechanism for input to “Direct and Manage Project Work”
  1. **Monitor and Control Project Work**
     1. No Project Tracking will be possible which will lead to delays in timelines, cost over runs, unhandled risks etc.
     2. No Work Performance reports will be available to access the current and future forecast of the project
  2. **Integrated Change Control**
     1. Without ICC there will be no documented change requested and reported to project team - that need to be reviewed and impact analysis to be performed. Hence, project delays will be inherent.
     2. Without following Integrated Change Control there will be no corrective or preventive actions to minimize adverse changes to project.