



دائرة اللوازم والمشتريات

عطاء رقم (T04 /2020.21)

Laboratory Information System (LIS)

2020-2021



## عطاء: Laboratory Information System (LIS)

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## الجزء الأول (1)

إعلان طرح عطاء رقم (T04/2020.21)**Laboratory Information System (LIS)**

تدعو الجامعة العربية الأمريكية الشركات المختصة الى المشاركة في العطاء المذكور أعلاه. يمكن الاستفسار أو الحصول على وثائق العطاء من دائرة اللوازم والمشتريات في الجامعة/ مبنى الدوائر الإدارية الطابق الثاني، هاتف- 04 2418888- تحويلة 1488 فاكس 04 2510972 بريد الكتروني pnp@aaup.edu مقابل مبلغ غير مسترد مقداره 50 دولار أمريكي تدفع في إحدى البنوك المعتمدة وذلك اعتباراً من يوم (الخميس) الموافق 29/10/2020

## ملاحظات :

1. تقديم عرضين: فني ومالي، وسيتم دراسة العروض فنياً ومالياً لاختيار العرض المناسب.
2. آخر موعد لتسليم العطاءات هو في تمام الساعة الثانية من يوم (الخميس) 12/11/2020 ولنفس المكان.
3. يجب تقديم كفالة دخول عطاء 5% من قيمة العطاء على شكل كفالة بنكية أو شيك بنكي مصدق لصالح الجامعة العربية الأمريكية.
4. الأسعار (دولار) وتشمل جميع الضرائب بما فيها ضريبة القيمة المضافة وعلى المورد تقديم الفواتير الضريبية وشهادة خصم المصدر.
5. الجامعة غير ملزمة بأقل الأسعار وبدون إبداء الأسباب.
6. رسوم الاعلان على من يرسو عليه العطاء.
7. بإمكانكم الاطلاع على النظام الداخلي لدائرة اللوازم والمشتريات من خلال زيارة صفحة الجامعة العربية الأمريكية على الانترنت. [www.aaup.edu](http://www.aaup.edu)



## الشروط والتعليمات التنظيمية للعبء

(2)

1. على جميع المشاركين في العبء الالتزام التام بهذه الشروط والتعليمات، وهي تعتبر جزءاً لا يتجزأ من أي أمر شراء أو عقد يبرم مع المشارك الفائز ما لم ينص صراحة على خلاف ذلك في أمر الشراء أو العقد.
2. في هذه الشروط والتعليمات يرمز إلى "الجامعة العربية الأمريكية بالاختصار (AAUP).
3. يجب أن تكون الشركة المتقدمة للعبء مسجلة رسمياً ومشتغلاً مرخصاً.
4. تقدم الأسعار (دولار) شاملاً لجميع الضرائب بما في ذلك ضريبة القيمة المضافة (VAT).
5. يلتزم المشارك الفائز بتقديم شهادات خصم المصدر والفواتير الضريبية اللازمة وأية مستندات قانونية أخرى تغطي عملية الشراء.
6. يجب أن تشمل الأسعار على جميع المصاريف المطلوبة من النقل والتركيب والتشغيل والفحص والصيانة والتدريب في المواقع المحددة في جدول المواصفات والكميات المرفق.
7. يجب أن تكون الأسعار المقدمة سارية المفعول لمدة لا تقل عن (90) يوماً من تاريخ تقديم العرض.
8. على المشارك الفائز تقديم كفالة حسن تنفيذ خلال أسبوع من تاريخ الاتفاقية بحيث تعادل (10%) من قيمة الاتفاقية على شكل كفالة بنكية صادرة عن إحدى البنوك العاملة في فلسطين أو شيك مصدق صادر لصالح "الجامعة العربية الأمريكية".
9. إذا تخلف المناقص الفائز عن تقديم كفالة حسن التنفيذ عن الموعد المحدد في البند السابق فإنه يحق لـ (AAUP) إلغاء الإحالة.
10. إذا تخلف المناقص الفائز عن التوقيع على عقد التنفيذ و تسليم الكفالات والتأمينات المطلوبه منه خلال أسبوع من تاريخ قرار الاحالة، يعتبر مستنكفا عن تنفيذ العبء ويصادر مبلغ الكفالة أو التأمين دخول العبء بالاضافة الى ذلك يتحمل فرق السعر و/أو اي أضرار أخرى قد تلحق بالجامعة نتيجة استنكافه ويحرم من لمشاركة في عطاءات الجامعة لمدة عام.
11. إذا تخلف المناقص الفائز عن تنفيذ العبء الذي احيل عليه او خالف شرطاً من شروط العقد يحق للجامعة مصادرة كفالة دخول العبء أو حسن التنفيذ أو جزء منها وتنفيذ العبء مباشرة من الجامعة أو اية جهة تراها مناسبة بالاسعار والشروط والطريقة المناسبة ويتحمل المناقص أي فروقات بالاسعار مضاف اليها 15% من اجمالي قيمة العبء.
12. يتحمل المناقص المتخلف دفع تعويض بدل اي عطل او ضرر قد يلحق بالجامعة نتيجة لذلك.





13. تعاد كفالة حسن التنفيذ بعد استكمال التوريد وجميع شروط العقد أو أوامر الشراء وبموجب الوثائق الأصولية اللازمة للاستلام.
14. على المشاركين في العطاء ارفاق كتالوجات عن المنتج.
15. يلتزم من يرسو عليه العطاء بدفع غرامة تأخير بواقع (0.1%) عن كل يوم تأخير من قيمة الأعمال المنجزة عن الوقت المحدد في الاتفاقية، ويتم احتساب هذه الغرامات من الدفعات المستحقة له أو من كفالة حسن التنفيذ.
16. يحق لـ (AAUP) إلغاء العطاء دون إبداء الأسباب كما أن (AAUP) غير ملزمة بإحالة العطاء على أقل العروض سعراً دون إبداء الأسباب. ولها أن ترفض كل أو بعض العروض المقدمة لها دون أن يكون لأي من المشاركين الحق في الرجوع إليها بأي خسارة أو ضرر ناجم عن تقديم عرضه ولا يترتب على (AAUP) أي التزامات مادية أو غير مادية مقابل ذلك.
17. يلتزم من يرسو عليه العطاء بتقديم كفالة بنكية (صيانة) بقيمة (5%) من قيمة الأعمال المنجزة صالحة لمدة عام من تاريخ تسليم الأعمال.
18. على المشارك في العطاء تقديم عرضه على أساس المواصفات الفنية المبينة في وثائق العطاء وبموجب الكميات المحددة في جدول الكميات المرفق.
19. لا يجوز للمشارك في العطاء أن يتنازل لأي طرف آخر عن كل أو جزء من أمر الشراء دون الحصول على إذن خطي من (AAUP) مع الاحتفاظ بكامل حقوق (AAUP) وفقاً لشروط أمر الشراء.
20. عند دراسة العروض يؤخذ بعين الاعتبار كفاءة المناقص من الناحيتين المالية والفنية وقدرته على الوفاء بالتزامات العطاء وخبرته في تقديم اللوازم المطلوبة والسمعة التجارية والتسهيلات التي يقدمها ويجوز استبعاد عرضه لنقص كل أو بعض هذه المتطلبات.
21. لا تقبل العروض أو التعديلات التي ترد بعد التاريخ والموعده المحدد كآخر موعد لتقديم العروض.
22. يجب تعبئة جداول المواصفات المرفقة و لن ينظر بأي عرض لا يلتزم بتعبئة الجداول.

- ❖ ويسمح بتقديم عرضان اثنان فقط كحد أقصى لكل بند.
- ❖ يجب تقديم عرضي الاسعار الفني والمالي بنسختين: الأولى ورقية، والأخرى الكترونية (محواسبة).
- ❖ تقديم العرضين المالي والفني الورقيين بالظرف المختوم، مع ضرورة وضع ختم الشركة والتوقيع على كل الصفحات (للعرض المالي بالذات).



(3)

### طريقة الدفع

خلال (90) يوماً من التوريد والقبول والاستلام النهائي، مقابل تقديم الكفالات المطلوبة.



الجزء الثاني

1. جدول الكميات والمواصفات الفنية  
**Laboratory Information System (LIS)**

No.	Product	Qty	Unit Price USD	Total Price USD
1	Laboratory Information System (LIS)	1		
Total				

في حالة وجود استفسار يرجى تزويدنا بها من خلال البريد الالكتروني للرد عليها [pnnp@aaup.edu](mailto:pnnp@aaup.edu)



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## 1 Introduction and Executive Summary

Arab American University (AAUP) is seeking for a qualified vendor to supply, install and implement Laboratory Information System (LIS) in University labs in order to Support the operations and diagnostic activities of the laboratory, from ordering, results, to the control of the analysers up to the final reporting. AAUP aims to raise the quality of services with the supervision of specialists and researchers in various fields of health sector. Where the university opened clinical labs that provides diagnostic laboratory tests and genetic tests for all citizens, in addition to Anatomic Pathology laboratories

## 2 General Requirements

**AAUP is seeking a supplier capable of providing a comprehensive solution based on all of the requirements encompassed within this RFP, a solution with a well-defined architecture, and a solution that includes a comprehensive plan for implementing the solutions, continuing service and support.**

- Suppliers are required to architect/propose a solution that best meets AAUP stated requirements using industry best practices.
- Vendor shall provide the Implementation & Support for all solution components (The vendor should be responsible for the successful implementation of all project aspects and phases).
- Vendor shall provide the needed training on all solution components.

## 3 Project Deliverables

**Consolidated list of deliverables shall be provided with the Proposal. All documents, products, services, facilities, activities and responsibilities of the vendor as they relate to requirements of this RFP must be clearly stated. Please refer to the below technical requirements sections for more details.**

### **Project deliverables include:**

- A detailed project plan (Grant chart) that includes all project phases, milestones, critical path, key activities, resources, and delivery dates must be provided.
- Project plan must be used during project implementation as a reference for both planned (baseline) and actual time line.
- The exact requirements of AAUP resources must be explained.
- A list of potential risks and risks mitigation plan must be included.
- The Project management tool that will be used and accredited is Microsoft Project.
- Communication plans as well as all templates of communication among project team members must be provided. The escalation procedures, progress reporting, and procedures of conflict management must be stated clearly.



- A detailed Implementation Plan, Solution Design, Solution Description, Operation documents, & Project SOW.
- Functionality, Integration, Acceptance, Performance, Security, load & Stress, Network, & Handover Testing forms and documents.
- A detailed Support Contract after Standard Warranty/1Years Support)

#### 4 Customer References

Each vendor shall include a list of projects (Minimum 3 Projects) where similar services as described within this RFP were successfully completed by the vendor or agent and by any major sub-vendors or suppliers.

Contact details shall be provided as AAUP may elect to contact all or some referees

#### 5 Training and Documentations

##### **Training shall include system admin training and end user training:**

- **Administration training:** Training should include all aspects of configuration, management and administration of each of the solution components in order to bring AAUP team to the desired professional operational level.
- **End user training:** Train AAUP end user on all system functionalities and processes from end user point view and based on user role.

A clear training plan should be provided in addition to onsite handover sessions for all project's aspects.

#### 6 Project Experience

Vendors shall provide details of their experience and presence in Palestine. If the presence is through an agent/Partner, full details of their relationships shall be disclosed

#### 7 Technical Support and Maintenance

To be filled according to embedded excel requirement, and detailed SLA shall be provided vendor response The vendor must also provide all the required, incomplete or required requirements within a year period for free.

#### 8 Right of Rejection

AAUP reserves the right to accept or reject any or all responses to this RFP without any compensation or explanation to any participants. AAUP reserves the right to accept any phase or lot of a Response, without being obliged to accept any of the other lots or phases, whether from the same participant or from any participant, and to enter into discussions of any sort with more qualified agencies at the same time if such actions are in best interest of AAUP.



## 9 Contract Award

AAUP reserves the right to award a contract based solely on the Proposal or to negotiate with the vendor. Issuance of this RFP, preparation, submission, and evaluation of vendor response does not commit AAUP to award a contract to the vendor. Only a written contract will obligate AAUP to the vendor services. AAUP reserves the right to split an award between the vendors as it may deem appropriate

## 10 Notification of Result

AAUP will notify all vendors who submit Proposals in response to this RFP of the results of the selection process

### 1- Selection Process

AAUP will not necessarily accept the lowest price or any proposal. Any implication that the lowest price or any proposal will be accepted is hereby expressly negated

- **Selection:**

**The successful bidder will be selected based upon evaluation criteria developed by AAUP which in its sole discretion will determine the manner in which each response to this Request for Proposal meets the evaluation criteria**

- **Evaluation Criteria:**

Each response to this Request for Proposal will be evaluated by AAUP to determine the degree to which it responds to the requirements as set out. Because this is a Request for Proposal, other factors in addition to price will be considered when submissions are evaluated. Criteria to be considered will include, but not necessarily be limited to:

**A. Proposal**

- i.Scope of work
- ii.Project Timeline

**B. Qualifications:**

- i.Team Experience
- ii.Company Profile
- iii.References

**C. Price**





11 Technical Requirements:1- **Module Features**- **Covering all sections/departments of the lab including:**

- Chemistry
- Hematology
- Serology
- Coagulation
- Routine Tests
- Special Tests
- Microbiology & cultures
- Pathology
- Molecular Genetics

- **Having a comprehensive lab tests data sets including:**

- Dealing with single tests or group (profile) tests
- Covering lab tests normal ranges by: age, gender, kit, etc.
- Tests precautions
- Defining more than unit per test (according to reagent materials)
- Samples types
- Kits types
- Tubes types
- Lab tests panic values
- Lab test time and duration
- Default lab tests results (like: positive, negative, nil, etc.)
- International lab tests codes (CPT codes, ICD codes)

- **Dealing with different types of patients: outpatient, stat, emergency & clinics patients**- **System should integrate with existing "ERP" system used in AAUP.**- **System should be able to extract financial reports for different financial operations on specific dates from entering or cancelling any financial transaction (cash receipt, check receipt).**- **System should be able to give specific permission to the financial department to cancel any transaction with records of cancelation.**- **System should include patient accounting module.**- **System should include inventory module.**- **System should include financial module.**- **System should integrate with existing "MyClinic" system used in AAUP.**- **MyClinic is an online, Cloud Based, fully dynamic, multi-lingual, multi-user, scalable, highly secure and user-friendly Clinical Management system which works for clinics, and polyclinics. MyClinic has rich features that cover all the medical and administrative requirements of any clinic or polyclinic, such as patient registration, appointments, doctor visits, patient accounting, radiology, medical forms, medical reports, dashboards and much more. MyClinic works on any web browser with responsive design feature, in addition to a native mobile application for doctors and patients that works on both iOS and Android operating systems. As our staff is fully trained and qualified to provide impeccable installation, implementation and technical support of the system**- **System should support a master patient index (MPI) with many demographic information: Name (4 parts) – Arabic & English, data of birth, gender, ID number, ID Type, address (governorate, city and address), Contact information, patient image, etc.**

- Allowing to send lab orders from clinics, departments and emergency through an "order management system"
- The order management system will allow to track the status of each lab order and the status of lab tests within the order
- The order management system will allow to track the sender information: department, medical staff, date, patient details, medical history, order priority, test section and tests details
- Assigning a unique order number for each lab order
- Allowing to add, update, cancel, refuse and rescheduling orders
- Allowing to prioritize orders (urgent, normal, etc.)
- Dealing with collecting samples from departments and delivering samples to the lab through a full log history (sample details, collecting date/time, collecting staff, collecting status, notes, delivering date/time, delivering staff, delivering status, notes, receiving staff, receiving status, notes, etc.). This function can be through scanning samples barcodes
- Allowing lab departments to see all orders through worklist to view list of orders to be proceeded with all the related information (ordering department, doctor name, order details, etc.)
- Dealing with specimen rejection including reason, user and date. The system should notify the ordering department/staff about this rejection indicating the reason of rejection
- Dealing with printing labels and barcodes to be used in the tubes and to support integration with lab devices. System should support different label/barcodes sizes and materials that include patient identification, sample identification, requested tests, etc.
- Allowing to print lab worksheet report for manual result entry
- Allowing to schedule and give appointments for lab tests per lab machine, test, dates slots
- Printing appointment slip that contains: patient information, appointment information, appointment type, instructions and comments
- Allowing to deal with appointment waiting list when no appointment slot available
- Allowing to view/print scheduled appointments using many parameters: date, test section, test name, machine, etc.
- Through appointment module, the user can update/cancel appointment
- Through appointment module, allowing to send notification to patients through email, SMS
- Allowing manual and automatic results entry
- Allowing to deal with different types of results: text, numeric, based on data set, calculated results based on the results of other tests
- Allowing to approve/disapprove results by authorized staff before making the results available to ordering staff/department and notifying the lab technician
- Allowing to view/search lab results using many criteria such as: date, patient, lab test section, lab test, result...
- Allowing to print tests results using pre-defined templates for each section/test
- Allowing to send messages, emails and whatsapp.
- Allowing to do build a portal for patients and doctors to get a results.
- Allowing to print previous results of the same test
- System should be able to provide lab test results trends graphs and results matrix
- System should allow to view and print previous lab results of the same test on the screens and results reports in order to compare between results of the same test
- Automatic result notification specially for critical results through the system, SMS or email for both: patients and medical staff.





- Easy and effective following method of the pending results (not resulted yet)
- Ability to review patient medical history including: allergies, chronic diseases, used drugs, blood type, visits, family history, etc.
- Allowing to attach any outside results/reports including pdf, images, word files
- Provide necessary audit trail information for access by authorized users. Include functions performed for each order, occurrence, and result, along with the identification of the user that is making the change, and the date and time of entry. When results are modified, the previous data should be maintained in the database for display on demand.
- Dealing with calibration tests done on machine through registering tests, results and getting necessary reports
- Linking lab services with patient accounting module that can handle all types of payments in different currencies and through different payments methods
- The patient accounting module should allow to register different financial transactions: deposit, receipt, invoice, cancel invoice, cheque tracking, cheque return, etc.
- The patient accounting module should allow to handle different insurances, converges and different price lists
- Through the patient accounting module, the user can print patient statement of account, daily work transactions, insurance claims, etc.
- Linking lab module with an inventory module to track all the related inventory transactions and control (batch control, expiry control, supplier control, items dispensing transactions, etc.)
- Allowing to track sending/receiving lab tests to/from outside institutions
- System should support dealing with repeated tests done by lab technician due to: problems in the machine calibration or there is a doubt about the result
- System should deal with patients warning and alerts of certain problems: HIV, Hepatitis, etc.) to guide the lab technician about the patient status and condition
- Suggested screening tests according to patient age, gender, family history, etc.
- Supporting lab analyzer interface to connect and integrate various lab devices using wide range of protocols (HL7, serial, network, USB, etc.). The interface should allow send lab requests to machines and receive results from the machine and register the results automatically into the system
- **Pathology module that capture the following information:**
  - Patient demographics.
  - Referring doctor/surgeon name and contact info.
  - Patient medical record number
  - Specimen Collection Date
  - Specimen accession number
  - Specimen Accession Date
  - Site of biopsy
  - Clinical History
  - Clinical Diagnosis
  - Type of biopsy
  - Gross Examination (Macroscopic)
  - Microscopic Description
  - Final diagnosis
  - Diagnosis comment.
  - Consulting pathologists.
  - Slide summery (stains, numbers, blocks).



- Attachments.
- Specimen status: accessioned, pending, signed out.
- Staging and Grading
- ICDO
- Electronic sign out/signature of reports.  
Orders: stains, recuts, levels, consults.
- Dynamic and flexible pathology results report through: templates
- Providing the ability to connect to other systems using different communication methods: API, XML, etc.
- Reports to enable decision makers from all levels to view lab statistical and financial information:
  - Work load reports per department, clinic, physician, lab machine, user, test category, test name, patient, user, etc.
  - Different microbiology reports per: organism, antibiotic, result, etc.
  - List of pending or incomplete work including reason/s
- Ad hoc reporting. The system should provide an ad hoc or system query function. It should be able to access all specialized data elements for query purposes
- Export reports into PDF, excel, csv and text format
- **Molecular Genetics lab requirement**
  - Type of sample
  - Family history
  - Clinical diagnosis
  - Comment
  - Site of sample(source)
  - Treatment
  - Diagnostic or follow up sample
  - Previous test results

## 12 Security

The assessment revealed to have the security principles and practices to take a front seat in the architecture and design of the new system because of the requirement to have the various stakeholders to minimize the out of system processing as much as possible which means greater access to the system. The following sections lists the security needs

### 1- General Security Needs

The following features, functions and/or characteristics should be available in the new system (note some of the below features, functions and/or characteristics are inferred indirectly from the users' general needs):

#### 2- Strong Password Control:

- The system should the ability to setup users' password policies (per the industry's best practices) including the minimum length, mandating of the use of special and numeric characters, password expiry dates, password history, etc. and enforce these policies.
- Enforcing initial password change, handling of forgotten password without IT intervention.
- Enforce policies to prevent password "guessing" by either suspending an account after an "X" number of consecutive failed logins or by increasing the time between each failed login before allowing a new attempt. Alerting the administrator after an "X" failed attempts per user via email or SMS if available.





- Using of standard password one-way hashing function to store the password in the database.

### 3- Data Transmission Security:

- The system should include the usage of SSL certificates to minimize/eliminate the data leakage while in transit.
- The system should include the authentication and verification between the web client and the backend using standards and technologies such as the JSON Web Token (JWT) protocol as specified in the RFC 7519. This would decrease the probability of various man-in-the-middle attacks and ensure proper data transmission between the various ends.
- Reducing the potential for various vulnerabilities attacks including Cross-Site Scripting (XSS) risks by including the Content-Security-Policy (CSP) HTTP response header that helps to reduce the XSS risks on modern browsers by declaring, which dynamic resources are allowed to be loaded
- The enforcement of the use of utilizing parameterized database queries with bound, typed parameters by using an Object to Relation (ORM) layer. This would reduce or eliminate the database injection attack vector.
- If a need is deemed to have large files exchanged through the ftp protocol, there is a need to ensure that secure ftp server is used that complies with the latest security protocols, is efficient, and allows for resuming downloads if a disconnection happens

### 4- Users, Roles, and Authorities Definition

**The general need is to allow the system administrator a wide range of capabilities to manage the users and their access rights to ensure a proper and authorized access to the various functions of the system and data based on defined authority matrix. The following are a listing of these capabilities.**

- The system administrator should have the capability to manage the users of the system including creating new users, suspending users, assigning access rights to different modules, etc.
- The system administrator should have the capability to manage the users access rights based on the needed business roles, involvement in the workflow steps, and where needed to combine roles to allow users cross access according to business needs.
- The system administrator will manage user authorizations based on groups and roles: authorizations to use functionality and access data will be scoped for different groups and users will be given role-based profiles to access/use different functions within the group. The system administrator can add new role-profiles or change existing ones based on the security policies and procedures of AAUP.
- The system administrator will be able to grant permissions for users will only have access to reports and be able to specify which reports.
- Develop a security model to segregate the duties and control authorization of the various steps of the workflow activities

### 5- Auditing and Logging Capabilities

**The system should have strong audit capabilities to track the actions taken by users and then be able to generate reports based on pre-defined filters.**



- Any changing on system configuration by the administrator will be logged in the system by time and date and user.
- Any exception happens on system it will be logged in with time and date and exception information.
- Workflow process steps will be audited with date, time, and user.
- Admin users can view audit data with advance filtering

### 13 Reporting:

One of the frequently expressed need from the different users/stakeholders is the reporting functionalities that should be included in the new system. The following sections describe the various reports needed.

**Reports must be in accordance with the requirements of the business, where the supplier must provide all reports during the trial period and the first year of work for free.**

#### **In General, the system should have:**

- All reports should be exportable to different formats including PDF, Word, and Excel.
- Required Reports (Standard Reports) that meet the operational needs of the system should be built in, with sufficient filtering and searching based on each report's criteria.
- Ad-hoc Reports (based on standard views that abstract the physical tables) that allows the end user to construct his/her own reports for further analysis with minimum intervention from the IT department or support staff

#### **System Administration Reporting**

The system should include reporting functionalities that help the administrator manage the system and provide needed information during auditing or certain events.

- Audit trail report that identifies what was changed, when and by which user with the capabilities to search and filter using different criteria.
- Listing of users, their privileges, access rights, status, etc. with the capabilities to search and filter using different criteria.
- Error/Exceptions generated from the system or as a result of users' actions with the timestamp, component/user that generated the errors with the capabilities to search and filter using different criteria

#### **Development Technology, Tools, and Frameworks**

The vendor is proposing to use Microsoft Technology Stack, PostgreSQL/MySQL, and open source technologies where appropriate. As part of the planning phase, the vendor will submit a document, Standard Development Environment that will list all the tools, technologies, and frameworks that will be used in the development of the System and will mandate that all developers utilize this standardized development environment during their work on the System. The following is a list of the technologies, tools and frameworks that will be used during the development:

##### 1- Operating Systems

- Microsoft Server O/S 2016 x64 or better (the exact version will depend on the current infrastructure in the main data center).
  - Privileged identity protection





- Breach resistance
  - Secure virtualization
  - Built-in SDDC capabilities
  - Affordable and enterprise ready
  - Cloud-ready application platform
  - delivers security at the OS level, including built-in breach resistance
  - specifically designed to support application development and innovation using container technology
- 2- **Windows 10 x64 (Developers Environment).**
- A Familiar Interface.
  - One Universal Windows Experience.
  - Advanced Security and Management.
  - Improved Device Management.
  - Compatibility for Continuous Innovation
- 3- **Integrated Development Environment (IDE)**
- Microsoft Visual Studio 2017 Professional Edition
  - Flexible. Professional developer tools for building any application type.
  - Have a Powerful features such as CodeLens that improve team's productivity.
  - contain Agile project planning tools, charts
  - Support Cross-platform technologies for Mobile apps.
  - Visual Studio 2017 Web performance and load testing tools
- 4- **Data Migration Tools**
- 5- **Technologies and Frameworks**
- Front End Tools and Technology
  - HTML5, Bootstrap 4 and Flex, Angular 7, jQuery 3.2.1, JOSN.
  - Back End Tools and Technology
  - C#, ASP.NET Core MVC 2.2, LINQ, Microsoft Entity Framework 6.2.0 with code First methodology.
  - Architecture Design
  - N-Tier MVC Web API Architecture with Interface contract

#### 14 Nonfunctional requirements

##### 1- Usability:

- The system will be user friendly and easy to use. With the UI best practices.
- Training sessions will be held for all kind of users of the system.

##### 2- Suitability:

- the system will provide an appropriate set of functions for specified tasks in this project.

##### 3- Fault tolerance:

- the system will maintain exception handling and error handling methodology to log errors occurred and design specific module for expected errors handling and also for unknown errors happened on system.

##### 4- Efficiency:

- the system will be developed using best practice to assure efficient resource consuming on servers. As performance unit test for each functionality or feature





**5- Appearance:**

- looking pleasant and compatible with all screens (mobile, tablets and computer screens).

**6- Deployment:**

- ease, speed and reliability of deploying the system.

**7- Performance:**

- Database level performance overview:
  - Indexing will be implemented on tables on primary key columns.
  - Database will be designed and normalized using best practice to make sure we achieve high performance.
  - SQL server instance will be configured and adjusted for best performance.
- Application level performance overview:
  - Separation between backend and front-end development.
  - Separation means there are no unnecessary data exchange between client and server client only ask for data using APIs without HTML content.
  - Client-side application will be single page application which means only necessary data exchange happened between client and server which minimize size of data going through request and response.
- To achieve best performance on application level System will be developed using latest technology standards as the following:
  - Separation between backend and front-end development.
  - Separation means there are no unnecessary data exchange between client and server client only ask for data using APIs without HTML content.
  - Client-side application will be single page application which means only necessary data exchange happened between client and server which minimize size of data going through request and response.
- Microsoft Core web API technology will be used as backend development which has great performance indicators since it depends on dependency injection methodology so only required DLLs and reference loaded with application which affect performance.
  - Angular 8 will be used for frontend development

**8- Projects Operations**

- Software Updates & Upgrade
  - Provides future software releases, updates, and professional service to all applications/Software/Tools as part of regular software maintenance fees.
- Technical Documentation
  - Provide Solutions Technical/Customize documentation for support staff including system overviews, Handover Documents, design, flowcharts, plan, SOW, Operation, BoM, Support Contract and file layouts, Etc.
- User Manuals
  - Provides complete set of user manuals &/ customize manuals for all hardware and software applications to document and explain system features and functions

