Course Code	Course Name	Category	L	T	P	Credit
20MBA292	**BUSINESS DATA MINING**	Elective	3	0	0	3

Preamble: Business Data mining is the technique of discovering correlations, patterns, or trends by analyzing large amounts of data stored in repositories such as databases and storage devices. It's a crucial part of advanced technologies such as machine learning, natural language processing (NLP), and artificial intelligence.

Prerequisite: NIL

Course Outcomes (COs): After the completion of the course the student will be able to

CO 1	Define all the concepts, theories, terminologies associated with various models in business data mining
CO 2	Explain all the conceptual models of machine learning and data mining
CO 3	Apply the logic and algorithm in data mining to solve various business scenario
CO 4	Analyse various business problems using various techniques used in business data mining
CO 5	Evaluate the various machine learning tools to apply in most appropriate situation

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1		2			
CO 2		2			
CO 3		2			
CO 4		3			
CO 5		3			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (in %)		End Semester Examination (in marks)
	1	**2**	
Remember	20	20	10
Understand	40	40	30
Apply	40	40	20
Analyze			
Evaluate	Can be done through Assignments/ Seminars/Mini Projects		
Cr`eate	Can be done through Assignments/ Seminars/Mini Projects		

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 4 marks

Continuous Assessment Test (2 numbers) : 16 marks

Assignment/Quiz/Course project : 10 marks

Seminar and Discussion : 10 marks

End Semester Examination Pattern:

There will be three parts; Part A, Part B and part C. Part A contains 5 questions (one question each from each module) of 2 marks each (Students should answer all questions). Part B contains 5 questions (one question each from each module) of 10 marks each (Students have the choice of answering any three questions). Part C contains a compulsory question (can have sub-divisions) of 20 marks (from any of the modules or combination) may be in application-level or case study.

Model Question paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER MBA DEGREE EXAMINATION

20MBA292– BUSINESS DATA MINING

Max. Marks: 60   Duration: 3 Hours

PART A
Answer **all** questions. Each question carries 2 marks

1. Define Data flood
2. What is Naïve Bayes method?
3. Define cost sensitive learning
4. Define WSARE.
5. What is lift and benefit estimation?

(5x2 marks = 10 marks)

PART B
Answer any **three** questions. Each question carries 10 marks

6. Explain in detail about knowledge representation in decision table and decision tree. What are the various rules involved in plotting?

7. Illustrate in detail about OneR, Naive Bayes method? How it is useful in data representation?

8. Explain in detail about cross validation. How lift and gain charts are useful in data mining.

9. Explain in detail regarding data visualisation. How scatter plots and stick figures are useful.

10. Explain in detail regarding ethical and security issues related with business data mining.

(3x10 marks = 30 marks)

PART C
Compulsory Question. This question carries 20 marks

11. Imagine that you are planning to start a e-commerce company in Kerala. You are starting online grocery shop like Big Basket. The targeted market is only Kerala. Apply targeted market and applied modelling for a new e-commerce company.

(1x20 marks = 20 marks)

Syllabus	
Module 1	**Machine Learning, Data Mining, Concepts, attributes and Output** Data Flood; Data Mining Application Examples; Data Mining and Knowledge Discovery; Data Mining Tasks; Machine Learning and Classification, Examples; Learning as Search; Bias, Weka; Preparing the data; Knowledge Representation - Decision tables; Decision trees; Decision rules; Rules involving relations; Instance-based representation.
Module 2	**Classification** Basic Methods – OneR, Naïve Bayes; Decision Trees - Top-Down Decision Trees, Choosing the Splitting Attribute, Information Gain and Gain ratio; C4.5 - Handling Numeric Attributes, Finding Best Split Dealing with Missing Values, Pruning, Pre-pruning, Post-Pruning, Estimating Error Rates, From Trees to Rules; CART - CART Overview and Gymtutor Tutorial Example, Splitting Criteria, Handling Missing Values, Pruning, Finding Optimal Tree; Other Methods – Rules, Regression, Instance-based (Nearest neighbour).
Module 3	**Evaluation & Credibility and Lifts & Costs** Definition, Classification with Train, Test, and Validation sets Handling Unbalanced Data; Parameter Tuning, Predicting Performance, Evaluation on "small data": Cross-validation Bootstrap, Comparing Data Mining Schemes, Choosing a Loss Function; Lifts & Costs - Lift and Ga charts, ROC, Cost-sensitive learning, Evaluating numeric predictions, MDL principle and Occam's razor; Data Preparation for Knowledge Discovery - Data understanding, Data cleaning, Date transformation, Discretization, False "predictors" (information leakers), Feature reduction, leaker detection, Randomization, Learning with unbalanced data.
Module 4	**Clustering, Association, Visualizations and Summarization** Clustering – Definition, K-means, Hierarchical; Association – Transactions, Frequent item sets, Association rules, Applications; Visualization – concept, Graphical excellence and lie factor, Representing data in 1,2, and 3-D, Representing data in 4+ dimensions - Parallel coordinates, Scatter plots, Stick figures; Summarization and Deviation Detection – Summarization, KEFIR: Key Findings Reporter, WSARE: What is Strange About Recent Events.
Module 5	**Applications** Targeted Marketing and Customer Modelling - Direct Marketing Review, Evaluation: Lift, Gains, Lift and Benefit estimation; Genomic Microarray Data Analysis – Definition and techniques; Data Mining and Society; Future Directions; Data Mining and Society: Ethics, Privacy, and Security issues; Future Directions for Data Mining, web mining, text mining, multi-media data.

Text Books

1. Shinde S. K. and Uddagiri Chandrasekhar (2015), *Data Mining and Business intelligence*, Dreamtech Press.

2. Hand David, *Principles of Data Mining,* PHI Learning Private Limited-New Delhi.

3. Ian H. Witten, Eibe Frank, Mark A. Hall, (2010). *Data Mining: Practical Machine Learning Tools and Techniques*, Paperback, Elsevier.

4. Berry M. J. A. and Linoff G. S. (2008). *Mastering Data Mining*, Wiley India Private Limited, 2008

References and Suggested readings

1. Kumar T.V.S., Reddy B. E., and Kallimani J.S. (2012). *Data Mining: Principles and Applications*, Elsevier.

2. Shmueli G., Patel N.R., and Bruce P.C., (2010) *Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XL Miner*, Wiley-Blackwell.

3. Delmater R. and Hancock M. (2001). *Data Mining Explained: A Manager's Guide to Customer-centric Business Intelligence,* Digital Press, 2001

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Machine Learning, Data Mining, Concepts, attributes and Output**	
1.1	Data Flood; Data Mining Application Examples; Data Mining and Knowledge Discovery;	2 Hours
1.2	Machine Learning and Classification, Examples; Learning as Search; Bias, Weka; Preparing the data	3 Hours
1.3	Knowledge Representation - Decision tables; Decision trees; Decision rules; Rules involving relations; Instance-based representation.	2 Hours
2	**Classification**	
2.1	Basic Methods – OneR, Naïve Bayes; Decision Trees - Top-Down Decision Trees, Choosing the Splitting Attribute, Information Gain and Gain ratio	3 Hours
2.2	Handling Numeric Attributes, Finding Best Split Dealing with Missing Values, Pruning, Pre-pruning, Post-Pruning, Estimating Error Rates, From Trees to Rules	2 Hours
2.3	CART - CART Overview and Gymtutor Tutorial Example, Splitting Criteria, Handling Missing Values, Pruning, Finding Optimal Tree; Other Methods – Rules, Regression, Instance-based	3 Hours
3	**Evaluation & Credibility and Lifts & Costs**	
3.1	Definition, Classification with Train, Test, and Validation sets Handling Unbalanced Data; Parameter Tuning, Predicting Performance, Evaluation on "small data": Cross-validation	2 Hours
3.2	Bootstrap, Comparing Data Mining Schemes, Choosing a Loss Function; Lifts & Costs - Lift and Gains charts, ROC, Cost-sensitive learning, Evaluating numeric predictions, MDL principle and Occam's razor;	2 Hours
3.3	Data Preparation for Knowledge Discovery - Data understanding, Data cleaning, Date transformation, Discretization, False "predictors" (information leakers), Feature reduction, leaker detection, Randomization, Learning with unbalanced data.	3 Hours
4	**Clustering, Association, Visualizations and Summarization**	
4.1	Clustering–Definition, K-means, Hierarchical; Association– Transactions, Frequent item sets, Association rules	2 Hours
4.2	Applications; Visualization – concept, Graphical excellence and lie factor, Representing data in 1,2, and 3-D, Representing data in 4+ dimensions - Parallel coordinates, Scatterplots, Stick figures;	2 Hours

4.3	Summarization and Deviation Detection – Summarization, KEFIR: Key Findings Reporter, WSARE: What is Strange About Recent Events.	2 Hours
5	**Applications**	
5.1	Targeted Marketing and Customer Modelling - Direct Marketing Review, Evaluation: Lift, Gains, Lift and Benefit estimation	2 Hours
5.2	Genomic Microarray Data Analysis – Definition and techniques; Data Mining and Society; Future Directions; Data Mining and Society:	3 Hours
5.3	Ethics, Privacy, and Security issues; Future Directions for Data Mining, web mining, text mining, multi-media data.	3 Hours
	Total	36 Hours
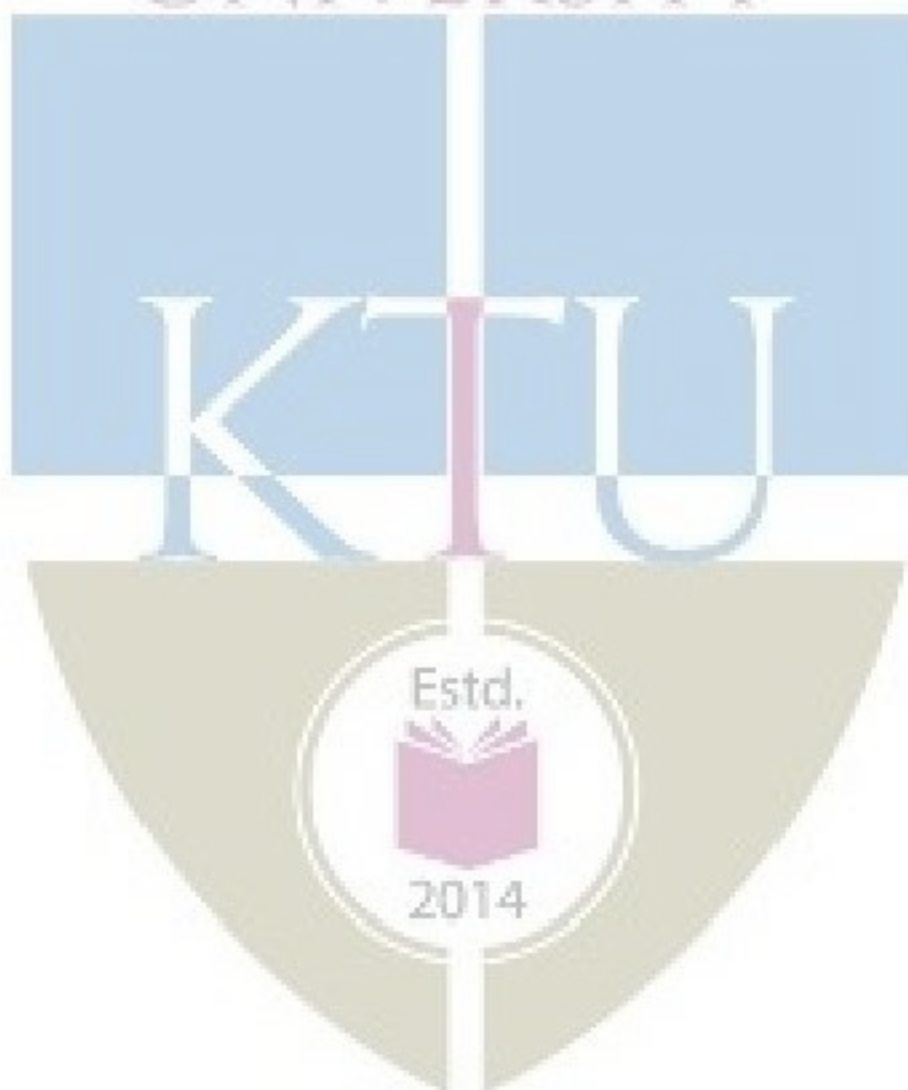
Course Code	Course Name	Category	L	T	P	Credit
20MBA294	SOFTWARE PROJECT MANAGEMENT	Elective	3	0	0	3

Preamble: This course intends to equip students with required knowledge and ability to manage software projects and to overcome challenges associated with software projects in today's complex business environment.

Prerequisite: Nil

Course Outcomes (COs): After the completion of the course the student will be able to

CO 1	Explain Software Project Management and the various ways to initiate a software project
CO 2	Examine the methods for Activity planning and Risk Management
CO 3	Evaluate Software process models and to appraise the Effort Estimation techniques for Software Project Management
CO 4	Assess the cost monitoring and control methods for Software Projects
CO 5	Analyze the impact of groups, teams and organisational structure in Software Project Management

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	1	1	-
CO 2	3	3	2	1	1
CO 3	3	3	2	2	2
CO 4	3	3	2	2	2
CO 5	3	2	3	3	3

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (in %)		End Semester Examination (in marks)
	1	2	
Remember	20	20	10
Understand	40	40	30
Apply	40	40	20
Analyze			
Evaluate	Can be done through Assignments/ Seminars/Mini Projects		
Create	Can be done through Assignments/ Seminars/Mini Projects		

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance   : 4 marks

Continuous Assessment Test (2 numbers)   : 16 marks

Assignment/Quiz/Course project   : 10 marks

Seminar and Discussion   : 10 marks

End Semester Examination Pattern:

There will be three parts; Part A, Part B and part C. Part A contains 5 questions (one question each from each module) of 2 marks each (Students should answer all questions). Part B contains 5 questions (one question each from each module) of 10 marks each (Students have the choice of answering any three questions). Part C contains a compulsory question (can have sub-divisions) of 20 marks (from any of the modules or combination) may be in application-level or case study.

Model Question paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER MBA DEGREE EXAMINATION

20MBA294– SOFTWARE PROJECT MANAGEMENT

Max. Marks: 60   Duration: 3 Hours

PART A
Answer *all* questions. Each question carries 2 marks.

1. What is project planning, why is it important?

2. Differentiate between CPM and PERT techniques.

3. What are Process models?

4. Identify the stages in Contract placement.

5. What is the role of a software project manager in decision making?

(5x2 marks = 10 marks)

PART B
Answer any *three* questions. Each question carries 10 marks

6. (a) List and brief the various activities covered by software project management.
   (b) Explain in detail about step wise project planning.

7. (a) Explain network planning model in detail.
   (b) Elucidate the approaches in detail to identify the activities or tasks in a project.

8. (a) Do you agree with the statement that "an easy and useful way to estimate software efforts and costs is to estimate the lines of code of the software"?
   (b) Examine some of the project related cost factors of a software cost estimation model?

9. (a) Critically examine the Earned Value Analysis.
   (b) Classify the types of contracts and explain in detail.

10. (a) Explain the Oldham - Hackman job characteristic model.
    (b) Explain the method to overcome from stress, health and safety issues in managing the people and organizational teams.

(3x10 marks = 30 marks)

PART C
Compulsory Question. This question carries 20 marks

11. Case Study:

A software project has two main activity dimensions: engineering and project management. The engineering dimension deals with building the system and focuses on issues such as how to design, test, code, and so on. The project management dimension deals with properly planning and controlling the engineering activities to

SYSTEMS

meet project goals for cost, schedule, and quality. If a project is small (say, a team of one or two working for a few weeks), it can be executed somewhat informally. The project plan may be an e-mail specifying the delivery date and perhaps a few intermediate milestones. Requirements might be communicated in a note or even verbally, and intermediate work products, such as design documents, might be scribbles on personal note pads. These informal techniques, however, do not scale up for larger projects in which many people may work for many months—the situation for most commercial software projects. In such projects, each engineering task must be done carefully by following well-tried methodologies, and the work products must be properly documented so that others can review them. The tasks in the project must be carefully planned and allocated to project personnel and then tracked as the project executes. In other words, to successfully execute larger projects, formality and rigor along these two dimensions must increase. Formality requires that well-defined processes be used for performing the various tasks so that the outcome becomes more dependent on the capability of the processes. Formality is further enhanced if quantitative approaches are employed in the processes through the use of suitable metrics.

Infosys is a software house headquartered in Bangalore, India. Its stated mission is "to be a globally respected corporation that provides best-of-breed software solutions delivered by best-in-class people." It employs the global delivery model, in which the customer can be located anywhere in the world and customer fulfilment can be provided from anywhere. In this model, the customer is sought anywhere in the world where it provides the most value to the company. For customer fulfilment, a combination of processes, technology, and management is employed to segregate the work so that value can be added in the most optimum locations and then reaggregated for delivery to the customer. The quality department at Infosys contains the software engineering process group (SEPG).The SEPG is responsible for coordinating all the process activities, including process definition, process improvement, and process deployment. It also manages all information and data related to the use of processes. For delivery of customer services, Infosys has many *business units*. Within a business unit, a *team*, headed by a *project manager*, executes a project. The project manager is responsible for all aspects of project execution, from determining the requirements to final installation of the software. The project manager reports to a *business manager*, who in turn generally reports to the *business unit head*.Because project managers have the main responsibility for satisfying the customer, they need to master not only executing the technical aspects of a project but also interacting with customers, eliciting requirements, managing the team, and so on. Clearly no one is likely to possess all the skills needed, so it's crucial to train people to develop the necessary skills. Infosys has implemented a variety of programs to help people transition from being engineers to being project leaders.

Questions:

a) Explain the activity dimensions in a software project. (10)

b) Elaborate on the role of a project manager at Infosys? (10)

Syllabus	
Module 1	**Introduction to Software Project Management:** Project Definition — Activities covered By Software Project Management-Importance of Software Project management –Requirement Specification-Overview of Project Planning – Stepwise Project Planning- Categorisation of Software projects -Conceptualization and initiation of IT project.
Module 2	**Activity Planning and Risk Management:** Objectives – Project Schedule – Sequencing and Scheduling Activities – Shortening Project Duration – Activity on Arrow Networks – Risk Management–Managing Risk; Risk identification – Assessment – Risk Planning -Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.
Module 3	**Project Life Cycle and Effort Estimation:** Software process and Process Models – Choice of Process models – mental delivery – Rapid Application development – Agile methods– Extreme Programming – SCRUM – Managing interactive processes. **Basics of Software Estimation:** Effort and Cost estimation techniques COCOMO II- A Parametric Productivity Model–Staffing Pattern.
Module 4	**Monitoring and Control:** Creating Framework – Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value Analysis - Getting Project Back to Target – Change Control – Managing Contracts – Contract Management.
Module 5	**Managing People and Organizing Teams:** Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model –Working in Groups – Becoming A Team –Dispersed and Virtual teams- Decision Making – Leadership – Organizational Structures – Stress –Health and Safety – Case Studies.

Text Books

1. Hughes B., & Cotterell M. (2009). *Software Project Management (5th Revised ed.)*. McGraw-Hill Education.
2. Ramesh G. (2021). *CBT on Managing Global Software Projects*. TMH.

References and Suggested Readings

1. Royce W. (1998). *Software Project Management (1st ed.)*. Pearson India.
2. Jalote P. (2021). *Software Project Management in Practices*. Pearson India
3. Mantel M. J. S. R. (2021). *Project Management Core Textbook*. Wiley India.
4. Schwalbe K. (2018). *Information Technology Project Management* (9th ed.). Cengage Learning

Course Contents and Lecture Schedule

No.		Topic	No. of Lectures
1		**Introduction to Software Project Management:**	
	1.1	Project Definition — Activities covered By Software Project Management-Importance of Software Project management	3 Hours
	1.2	Requirement Specification- Overview of Project Planning – Stepwise Project Planning	2 Hours
	1.3	Categorisation of Software projects -Conceptualization and initiation of IT project	3 Hours
2		**Activity Planning and Risk Management:**	
	2.1	Objectives – Project Schedule – Sequencing and Scheduling Activities – Shortening Project Duration	2 Hours
	2.2	Activity on Arrow Networks – Risk Management–Managing Risk; Risk identification – Assessment – Risk Planning -Risk Management	2 Hours
	2.3	PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.	3 Hours
3		**Project Life Cycle and Effort Estimation:**	
	3.1	Software process and Process Models – Choice of Process models – mental delivery – Rapid Application development.	2 Hours
	3.2	Agile methods– Extreme Programming – SCRUM – Managing interactive processes	2 Hours
	3.3	**Basics of Software Estimation:** Effort and Cost estimation techniques COCOMO II- A Parametric Productivity Model–Staffing Pattern.	3 Hours
4		**Monitoring and Control:**	
	4.1	Creating Framework – Collecting the Data – Visualizing Progress – Cost Monitoring	2 Hours
	4.2	Earned Value Analysis - Getting Project Back to Target – Change Control	2 Hours
	4.3	Managing Contracts – Contract Management	3 Hours
5		**Managing People and Organizing Teams:**	
	5.1	Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model	2 Hours
	5.2	Working In Groups – Becoming A Team –Dispersed and Virtual teams-Decision Making	2 Hours
	5.3	Leadership – Organizational Structures – Stress –Health and Safety – Case Studies.	3 Hours
		Total	36 Hours

Course Code	Course Name	Category	L	T	P	Credit
20MBA296	ENTERPRISE RESOURCE PLANNING	Elective	3	0	0	3

Preamble: Businesses across the world, especially the fortune 500 companies are running on Enterprise Resource Planning systems. This course has been designed to empower the business management students with deeper understanding and practical insights on ERP systems. Upon successful completion of the programme a student should be able to understand ERP systems, and shall confidently work in an ERP environment.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to:

CO 1	Explain the features of Enterprise Resource Planning systems
CO 2	Illustrate the relevance of Business Process Reengineering in ERP implementations
CO 3	Evaluate ERP solutions to manage project implementations
CO 4	Analyse business requirements and develop business blueprint using the capabilities of ERP systems
CO 5	Devise methods to appraise, assess and manage ERP projects successfully

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	2			
CO 2	2	2			
CO 3	3	3			
CO 4	3	3		2	
CO 5		2			

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (in %)		End Semester Examination (in marks)
	1	2	
Remember	20	20	10
Understand	40	40	30
Apply	40	40	20
Analyze			
Evaluate	Can be done through Assignments/ Seminars/Mini Projects		
Create	Can be done through Assignments/ Seminars/Mini Projects		

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 4 marks

Continuous Assessment Test (2 numbers) : 16 marks

Assignment/Quiz/Course project : 10 marks

Seminar and Discussion : 10 marks

End Semester Examination Pattern:

There will be three parts; Part A, Part B and part C. Part A contains 5 questions (one question each from each module) of 2 marks each (Students should answer all questions). Part B contains 5 questions (one question each from each module) of 10 marks each (Students have the choice of answering any three questions). Part C contains a compulsory question (can have sub-divisions) of 20 marks (from any of the modules or combination) may be in application-level or case study.

Model Question paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER MBA DEGREE EXAMINATION

20MBA296– ENTERPRISE RESOURCE PLANNING

Max. Marks: 60   Duration: 3 Hours

PART A
Answer *all* questions. Each question carries 2 marks.

1. List out any four ERP solutions.

2. Define change management in an ERP implementation context.

3. What is GAP analysis?

4. Recall the benefits of the sales and marketing module of an ERP system.

5. Explain the organizational benefits of SCM.

(5x2 marks = 10 marks)

PART B
Answer any *three* questions. Each question carries 10 marks

6. Explain business functions and elaborate the major functional modules of an ERP solution.

7. Discuss the various stages of BPR implementation in IT projects.

8. Elaborate the relevance of requirement analysis in the effective implementation of an ERP system.

9. Critically examine the salient features of human resource information system.

10. Explain the different types of risks faced in ERP implementation projects with suitable examples.

(3x10 marks = 30 marks)

PART C
Compulsory Question. This question carries 20 marks

11. Identify an ERP implementation project you are familiar with and discuss elaborately on the following dimensions.

    a) ERP product selection
    b) Implementation strategy
    c) Benefits of BPR
    d) Modules implemented
    e) Benefits to the organization
    f) Top management approach

(1x20 marks = 20 marks)

	Syllabus
Module 1	**Foundation for understanding Enterprise Resource Planning Systems** Emergence of ERP systems-What is ERP? – Evolution - Business benefits – ERP modules –ERP Vendors – ERP Products - ERP design architecture – Challenges of implementation of ERP system. Business functions, Processes, and data requirements - Functional areas- functional information systems. Case studies on ERP success and failures.
Module 2	**Business Process Reengineering (BPR) and ERP** BPR- Definition- Terminologies- Purpose- Relevance of BPR in ERP projects – BPR process – Stages in BPR implementation – Stakeholders – Change management – Changes that BPR can bring in an organization – Relevance of BPR in ERP project implementation. Case studies on BPR.
Module 3	**Planning, Design and Implementation of ERP systems** Traditional system development approaches – Contemporary approaches to system development – ERP system development processes – Planning – Requirement analysis – AS IS and TO BE study- GAP analysis – Selection of ERP solutions- Vendor selection- Design: reengineering versus customizing – Alternate ERP design options – detailed design - ERP implementation steps. Case study on ERP implementation.
Module 4	**Functional Module of an ERP system** Accounting and Finance- Accounting and finance processes – Management control processes in Accounting – Accounting and finance modules in ERP systems. Sales and Marketing – Sales and marketing processes- Management control processes in sales and marketing- Sales and marketing modules in ERP systems Production and materials management - Production planning and manufacturing processes - Management control processes in production and manufacturing – Production planning modules in ERP systems – Materials Management modules in ERP systems. Human Resources – Human resource management processes – Human resources information systems- Human resource modules in ERP systems. ERP Module integration. Cases study on ERP functional module integration.
Module 5	**ERP Implementation & Integration** ERP Implementation – Critical success factors – Risks in ERP projects implementation: technology, organizational, people and project related risks – Managing large scale ERP projects -Managing large scale ERP projects - Project related factors- other risk factors. ERP and SCM integration - ERP and CRM integration – e-business and ERP- Business intelligence with ERP. ERP Trends - Cloud ERP- Two-Tier ERP - Digital transformation - Other technology Integrated with ERP – Personalization - Predictive analytics - Mobile ERP - The Future of ERP. Case study on organisational transformation with ERP.

Text Books

1. Ashim Raj Singla (2009). *Enterprise Resource Planning,* Cengage Learning.
2. Alexis Leon (2014) *ERP demystified*, McGraw Hill Education India Private Ltd.
3. Goyal D. P. (2011). *Enterprise Resource Planning– A Managerial Perspective*, McGraw Hill Education Pvt Ltd.
4. Cedric Alexander (2011). *A Case Study Exploring the Effectiveness of ERP Integration Towards Managerial Performance*, Proquest, Umi Dissertation Publishing.
5. David L Olson (2003). *Managerial issues of ERP systems*, McGraw-Hill Higher Edn.

References and Suggested readings

1. Pramod Mantravadi M. (2003). *ERP – Concept and Cases*, ICFAI.
2. Dimpi Srivastava and Aarti Batra, (2010). *ERP Systems,* IK International Publishing House Pvt. Ltd.
3. Vinod Kumar Garg and N.K. Venkitakrishnan (2004). *ERP – Concepts and Practice,* Prentice Hall of India.
4. Sinha P. Mangal and Jeffrey Word (2009). *Essentials of Business Process and Information System*, Wiley India.
5. George Anderson, Charles D. Nilson, Tim Rhodes, Sachin Kakade, Andreas Jenzer, Bryan Kin, Jeff Davis, Parag Doshi, Veeru Mehta and Heather Hillary (2009). *SAP Implementation Unleashed: A Business and Technical Roadmap to Deploying SAP,* SAMS.
6. Jagan Nathan Vaman (2008). *ERP in Practice – ERP strategies for steering organizational competence and competitive advantage*, McGraw Hill Education India.
7. Alexis Leon (2007). *Enterprise Resource Planning*, McGraw Hill Education India.
8. Mahadeo Jaiswal (2008). *Enterprise Systems and Business Process Management,* Macmillan India.

Course Contents and Lecture Schedule

Sl. No.	Topic	No. of Lectures
1	**Foundation for understanding Enterprise Resource Planning Systems**	
1.1	Fundamentals and challenges of ERP systems	2 Hours
1.2	ERP design architecture	2 Hours
1.3	Business functions, Processes, and Data requirements	2 Hours
1.4	Case Study	2 Hours
2	**Business Process Reengineering (BPR) and ERP**	
2.1	Business Process Reengineering (BPR) and related concepts	5 Hours
2.2	Case Study	1 Hour
3	**Planning, Design and Implementation of ERP systems**	
3.1	Requirement analysis	2 Hours
3.2	ERP design	2 Hours
3.3	ERP implementation steps, Case Study	2 Hours
4	**Functional Module of an ERP system**	
4.1	Accounting and Finance	2 Hours
4.2	Sales and Marketing	2 Hours
4.3	Production and materials management	2 Hours
4.4	Human Resources	1 Hour
4.5	Case Study	1 Hour
5	**ERP Implementation & Integration**	
5.1	ERP Integration	2 Hours
5.2	ERP Project Management	2 Hours
5.3	ERP Integration with other systems	2 Hours
5.4	Future trends of ERP, Case Study	2 Hours
	Total	36 Hours

Course Code	Course Name	Category	L	T	P	Credit
20MBA298	CLOUD COMPUTING & CYBER SECURITY	Elective	3	0	0	3

Preamble: The course on Cloud Computing and Cyber Security helps the students to comprehend the concepts of both cloud computing and cyber security to aid managerial decision making. The course imparts knowledge about cloud computing and its application in business and helps to understand the importance of information management and cyber security for a business organization.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to:

CO 1	Evaluate the importance of Cloud Computing in Business.
CO 2	Analyse the service models and deployment models in cloud computing.
CO 3	Appraise the cloud services tools and applications for the community.
CO 4	Assess cyber security issues in business and society.
CO 5	Examine technological solutions for ensuring cyber security in the cloud

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	2	-	-	-
CO 2	-	3	-	-	-
CO 3	-	2	1	2	-
CO 4	-	3	2	2	-
CO 5	-	3	-	-	-

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (in %)		End Semester Examination (in marks)
	1	2	
Remember	20	20	10
Understand	40	40	30
Apply	40	40	20
Analyze			
Evaluate	Can be done through Assignments/ Seminars/Mini Projects		
Create	Can be done through Assignments/ Seminars/Mini Projects		

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance   : 4 marks

Continuous Assessment Test (2 numbers)   : 16 marks

Assignment/Quiz/Course project   : 10 marks

Seminar and Discussion   : 10 marks

End Semester Examination Pattern:

There will be three parts; Part A, Part B and part C. Part A contains 5 questions (one question each from each module) of 2 marks each (Students should answer all questions). Part B contains 5 questions (one question each from each module) of 10 marks each (Students have the choice of answering any three questions). Part C contains a compulsory question (can have sub-divisions) of 20 marks (from any of the modules or combination) may be in application-level or case study.

Model Question paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER MBA DEGREE EXAMINATION

20MBA298 CLOUD COMPUTING & CYBER SECURITY

Max. Marks: 60   Duration: 3 Hours

PART A
Answer **all** questions. Each question carries 2 marks.

1. Define Cloud computing.

2. What is Software as a Service?

3. What is google app engine?

4. Define Dos attack.

5. What is intrusion detection system?

(5x2 marks = 10 marks)

PART B
Answer any **three** questions. Each question carries 10 marks

6. Explain how cloud computing is relevant in today's dynamic business scenario. List the advantages and disadvantages of cloud computing.

7. Discuss in detail about cloud deployment models. Briefly explain various approaches for migrating to cloud.

8. Explain the role of cloud computing for community. Discuss the role of cloud computing in Corporation.

9. Explain how cyber terrorism has become a big threat to global business scenario. List down the various ethical and legal issues in cyber security.

10. Explain in detail about the term Cryptography and the processes involved in cryptography. Discuss how the companies are improving their data security using various tools.

(3x10 marks = 30 marks)

PART C
Compulsory Question. This question carries 20 marks

11. A medium scale manufacturer company in Kerala produces FMCG products. They are having various departments like a) Production b) HR c) Finance d)Marketing. They are now using conventional methods for all the processes in their business. They are now planning to expand their Business. They are really interested to move to cloud services to support all their business processes. Evaluate how they can ideally implement cloud in their various departments and explain how cloud computing helps to improve their efficiency.

(1x20 marks=20 Marks)

	Syllabus
Module 1	**Introduction to cloud computing**– Evolution of Cloud Computing – Cloud Architecture– Cloud Storage – Why Cloud Computing Matters –Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today - Cloud Services Web-Based Application – Pros and Cons of Cloud Service Development.
Module 2	**Service models and deployment models in cloud computing**-Types of Cloud Service Development –Software as a Service – Platform as a Service-Information as a Service – Web Services – On-Demand Computing-Cloud Deployment Models: Public, Community, Private & Hybrid Models-Approaches for Migrating to Cloud.
Module 3	**Cloud computing for everyone**- Discovering Cloud Services Development Services and Tools –Amazon Ec2 – Google App Engine – IBM Clouds-Cloud computing for the family (centralizing email communications, collaborating on schedules and to-do lists)-cloud computing for the community (collaborating on schedules, group projects and events)-cloud computing for the corporation (managing schedules, projects and collaborating on reports).
Module 4	**Introduction to cyber security** – cyber security and information security-ethical hacking-cyber laws-operations in computer networking-information assurance-security loopholes-cyber attacks-cyber terrorism and cyber crimes-frauds, information and identity theft-theft of funds-Dos attacks-digital security-digital forensics-malware functionality-legal and ethical issues in cyber security.
Module 5	**Cybersecurity management**- Hacking prevention-malware detection-cryptography-securing information online-encryption-firewalls-signature schemes-hash functions-authentication-estimating and eliminating security risks-detection and prevention of cyber attacks-Intrusion Detection systems and anti-virus software- cloud security-benefits.

Text Book

1. Michael Miller (2008). *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*, Que Publishing.

2. Dan C. Marinescu (2017). *Cloud computing: Theory and Practice*, Morgan Kaufmann.

3. Gregory J Touhill, C Joseph Touhill (2014). *Cybersecurity for Executives: A Practical Guide*, Wiley.

References and Suggested Readings

1. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, *Distributed and Cloud Computing: From Parallel Processing to the Internet of Things,* 1/e, Morgan Kaufmann.

2. Haley Beard, *Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs*, Emereo Pty Limited.

3. Kevin Mitnick (2017), *The Art of Invisibility*. Little Brown & Co.

4. Nina Godbole, Sunit Belapure, Cybersecurity: *Understanding cybercrimes, computer forensics and legal perspectives,* Wiley-India.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Introduction to cloud computing**	
1.1	History of cloud computing, cloud architecture and storage	2 Hours
1.2	Advantages, disadvantages, companies in the cloud	2Hours
1.3	Cloud services web-based application, pros and cons of cloud service development	3 Hours
2	**Service models and deployment models in cloud computing**	
2.1	Types of Cloud Service Development	2 Hours
2.2	Web Services, On-Demand Computing, Approaches for Migrating to Cloud	2 Hours
2.3	Compare and Contrast the Types of Demand Elasticity	3 Hours
3	**Cloud computing for everyone**	
3.1	Cloud Services Development Services and Tools, Amazon Ec2, Google App Engine, IBM Clouds	2 Hours
3.2	Cloud computing for the family and community	2 Hours
3.3	Cloud computing for the corporation	3 Hours
4	**Introduction to cyber security**	
4.1	Cyber security and information security, ethical hacking, cyber laws, operations in computer networking, information assurance	2 Hours
4.2	Security loopholes, cyber attacks, cyber terrorism and cyber crimes, frauds, information and identity theft	3 Hours
4.3	Theft of funds, Dos attacks, digital security, digital forensics, malware functionality, legal and ethical issues in cyber security	3 Hours
5	**Cybersecurity management**	
5.1	Hacking prevention, malware detection, cryptography, securing information online, encryption	2 Hours
5.2	Firewalls, signature schemes, hash functions, authentication, estimating and eliminating security risks	2 Hours
5.3	Prevention of cyber attacks, Intrusion Detection systems, cloud security.	3 Hours
	Total	36 Hours

Course Code	Course Name	Category	L	T	P	Credit
20MBA302	ENTERPRISE MANAGEMENT IN DIGITAL ERA	Elective	3	0	0	3

Preamble: The digital firms are different from traditional firms because of reliance on a set of information technologies. This course focuses on the use of information technologies to manage and organize the digital firm. Managers of digital firms need to identify the challenges facing their firms; discover the technologies that will help them meet these challenges; design business processes to take advantage of the technology; and create management procedures and policies to implement the required changes. The course will help to get a close view to new technologies which will influence strategic business decision making now and in the future and will introduce students to the IT operational processes and the various standards in order to see the world of IT operations.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to:

CO 1	Develop an understanding of managing a digital firm and its assets.
CO 2	Plan for organizational IT systems Infrastructure and its architecture.
CO 3	Acquire knowledge on the role of IT in creating a digital firm strategy.
CO 4	Appraise the application of emerging technology and the future of technology innovation.
CO 5	Identify the role of leadership in digital transformation.

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	2	2	1	2
CO 2	3	2	1	-	1
CO 3	3	2	1	1	1
CO 4	2	1	1	1	1
CO 5	3	2	3	2	3

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (in %)		End Semester Examination (in marks)
	1	2	
Remember	20	20	10
Understand	40	40	30
Apply	40	40	20
Analyze			
Evaluate	Can be done through Assignments/ Seminars/Mini Projects		
Create	Can be done through Assignments/ Seminars/Mini Projects		

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance   : 4 marks

Continuous Assessment Test (2 numbers)   : 16 marks

Assignment/Quiz/Course project   : 10 marks

Seminar and Discussion   : 10 marks

End Semester Examination Pattern:

There will be three parts; Part A, Part B and part C. Part A contains 5 questions (one question each from each module) of 2 marks each (Students should answer all questions). Part B contains 5 questions (one question each from each module) of 10 marks each (Students have the choice of answering any three questions). Part C contains a compulsory question (can have sub-divisions) of 20 marks (from any of the modules or combination) may be in application-level or case study.

Model Question paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER MBA DEGREE EXAMINATION

20MBA302 ENTERPRISE MANAGEMENT IN DIGITAL ERA

Max. Marks: 60   Duration: 3 Hours

PART A
Answer *all* questions. Each question carries 2 marks.

1. What are the characteristics of a virtual organisation?

2. Explain IT infrastructure.

3. Discuss 'snooping on employees?

4. What is the difference between technology and innovation?

5. Discuss the disadvantages of disruptive technologies?

(5x2 marks = 10 marks)

PART B
Answer any *three* questions. Each question carries 10 marks

6. Discuss scope and frame work for a successful entrepreneurship with artificial intelligence and blockchain? (10)

7. a. Evaluate the application of technology innovation in energy management? (5)
    b. Pros and cons of technology innovation in education. (5)

8. a. Compare the phases of digital firm strategy lifecycle? (5)
    b. Discuss with examples how would you manage security privacy in an organisation? (5)

9. a. Critically examine the infrastructure requirements for web-based database server? (5)
    b. Outline the main advantages and disadvantages of voice-based data communication. (5)

10. a. Summarize the guidelines for transforming a firm into a digital firm. (5)
    b. Discuss the skills and competencies for international human resource management. (5)

(3x10 marks = 30 marks)

PART C

Compulsory Question. This question carries 20 marks

11.   The 'ease of doing business will go a long way in catapulting India as an innovation hub, as per the report of Office of Controller General of Patents, Designs and Trademarks in Mumbai. A robust Intellectual Property Rights (IPR) infrastructure bolster the ecosystem of patents, design, trademarks, and GI (Geographical Indication) systems. The pendency in the IPR department has come down drastically. It has also been decided that any pending application should be completed within days and not months." The reduction in filing fees for start-ups, MSMEs and women entrepreneurs -- allowed by the department -- by 80 percent to help and support start-ups and women entrepreneurs in the country. To increase awareness about GI tag and its significance, scholarships for students studying the Intellectual Property law have been initiated. In last 5-6 years, India has seen a rapid increase in grant of patents and copyrights. The number of patents granted has gone up from 6,326 in 2015-16 to 28,391 in 2020-21, while trademarks registration has shot up from 65,045 in 2015-16 to 2,55,993 in 2020-21. Similarly, while 4,505 Copyrights were granted in 2015-16, a total of 16,402 were granted last fiscal.

Questions

a.   Explain the technological challenges faced by the start-ups and MSMEs in India?   (10)

b.   Evaluate the scope of Geographical Indication (GI) with examples?   (10)

	Syllabus
Module 1	**The Digital firm:** Introduction- information technology, enterprise, management, Defining the Digital Firm- Management, organization and technology issues in the digital firm, Comparison of traditional and digital firms, Managing the digital assets of the firm, Managing people in a digital environment, Management and Organizational Challenges in Digital Firms, Virtual organizations, Essential skills and competence for enterprise management- creativity and problem solving, design thinking and innovation, International human resource management.
Module 2	**Digital firm infrastructure and architecture:** organizational IT systems infrastructure, new technologies, IT infrastructure and architecture- Hardware, Software, Databases, Web-based database servers, Web page servers. Telecommunications -VANs, WANs and LANs to Web and WAP. Major trends in voice and data communications, Network types, The Internet, WAP and iMode, Connectivity and interoperability, Enterprise Systems and ASP (application service providers), Industrial networks and XRP (extended enterprise resource planning).
Module 3	**Digital firm strategy:** Strategy, role of IT in corporate strategy, waves of technological change, Competitive forces and institutions model, Value chain models, Resource models, Aligning organizational and IT strategies, B2C Digital Enterprise, Managing digital assets, Implications of Mergers and Acquisitions for IT, Life cycle issues, difficulties of aligning business strategy to IT strategy, New Management Issues Facing Digital Firms, Managing Information Rights and Obligations. Security- Privacy, Freedom of information, Protecting intellectual property: copyrights, Snooping on Employees, New techniques for employee protection from unobtrusive employer surveillance systems.
Module 4	**Technology and Innovation:** Managing emerging technologies, future of Technology evolution, advantages and applications of Cloud, Big Data, Internet of Things. Risks in technology management. Intelligent use of technology- in business, government and society, Application of emerging technology in areas of Energy, Healthcare, Environment, education. Future of Technology Innovation.
Module 5	**Digital transformation in leadership:** Issues and challenges, Framework for successful business entrepreneurship in the 21st century, Mapping innovation in digital transformation, Artificial Intelligence and Block Chain, Disruptive technologies, Ideation and Building business Solutions, Advertising and promotions in digital era, Leveraging technology for enterprise transformation, Humanitarian supply chain, Sustainability in digital era.

Text Books

1. Karim Mezghani and Wassim Aloulou, (2019). *Business Transformations in the Era of Digitalization*, IGI Global 2019.

2. Jun Xu, *Managing Digital Enterprise: Ten Essential Topics* 2014th Edition Atlantis Press.

3. Nuno Ribeiro (2011). *Managing in the Digital Era*, CreateSpace Independent Publishing Platform.

References and Suggested Readings

1. Clayton M. Christensen, (1997). *Innovators Dilemma: Why Great Companies Fail*, Harper Collins.

2. Thomas H. Davenport, (2000). *Mission Critical: Realizing the Promise of Enterprise Systems*, Harvard Business Review Press.

3. Philip Evans and Thomas S. Wurster, (2000). *Blown to Bits: How the New Economics of Information Transforms Strategy*, Harvard Business School Press.

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**The digital firm**	
1.1	Defining the Digital Firm	3 Hours
1.2	Managing the digital assets of the firm	2 Hours
1.3	Essential skills and competence for enterprise management	2 Hours
2	**Digital firm infrastructure and architecture**	
2.1	IT systems infrastructure	3 Hours
2.2	Telecommunications	2 Hours
2.3	Enterprise Systems	2 Hours
3	**Digital firm strategy**	
3.1	Strategy	2 Hours
3.2	B2C Digital Enterprise	3 Hours
3.3	New Management Issues Facing Digital Firms	3 Hours
4	**Technology and Innovation**	
4.1	Managing emerging technologies	3Hours
4.2	Cloud, Big Data, Internet of Things	2 Hours
4.3	Future of Technology Innovation	2 Hours
5	**Digital transformation in leadership**	
5.1	Framework for successful business entrepreneurship	2 Hours
5.2	Artificial Intelligence and Block Chain	2 Hours
5.3	Humanitarian supply chain	3 Hours
	Total	36 Hours

Course Code	Course Name	Category	L	T	P	Credit
20MBA304	**SOFTWARE ENGINEERING**	Elective	3	0	0	3

Preamble: This course emphasizes on the software concepts to equip management graduates to understand the key elements in software development. This course is designed to get familiarized with the industry standards, quality requirements and latest models in the software field.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to:

CO 1	Explain the software engineering concepts and various development models in organizations
CO 2	Analyse the principles of software requirements specification
CO 3	Evaluate the various estimation techniques in planning and executing a software project
CO 4	Assess the various concepts of software design and testing
CO 5	Analyse the significance of Capability Maturity Model for software and software quality assurance fundamentals

Mapping of course outcomes with program outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1	2	-	-	-
CO 2	-	3	-	-	-
CO 3	3	3	-	2	3
CO 4	-	3	-	-	-
CO 5	2	3	-	-	-

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (in %)		End Semester Examination (in marks)
	1	**2**	
Remember	20	20	10
Understand	40	40	30
Apply	40	40	20
Analyze			
Evaluate	Can be done through Assignments/ Seminars/Mini Projects		
Create	Can be done through Assignments/ Seminars/Mini Projects		

Mark distribution

Total Marks	CIE	ESE	ESE Duration
100	40	60	3 hours

Continuous Internal Evaluation Pattern:

Attendance   : 4 marks

Continuous Assessment Test (2 numbers)   : 16 marks

Assignment/Quiz/Course project   : 10 marks

Seminar and Discussion   : 10 marks

End Semester Examination Pattern:

There will be three parts; Part A, Part B and part C. Part A contains 5 questions (one question each from each module) of 2 marks each (Students should answer all questions). Part B contains 5 questions (one question each from each module) of 10 marks each (Students have the choice of answering any three questions). Part C contains a compulsory question (can have sub-divisions) of 20 marks (from any of the modules or combination) may be in application-level or case study.

Model Question paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER MBA DEGREE EXAMINATION

20MBA304– SOFTWARE ENGINEERING

Max. Marks: 60   Duration: 3Hours

PART A
Answer **all** questions. Each question carries 2 marks.

1. List the various phases in software development.

2. Differentiate between functional and non-functional requirements.

3. Assess significance of project monitoring plan.

4. Enumerate types of software designs.

5. Mention the five maturity levels of Capability Maturity Model.

(5x2 marks = 10 marks)

PART B
Answer any **three** questions. Each question carries 10 marks

6. Compare the various lifecycle models of software development.

7. Appraise the significance of Software Requirements Specification and requirements validation.

8. Evaluate any two project estimation techniques.

9. Analyze the different types of software testing techniques that are followed across many organizations.

10. Software quality assurance is a means and practice of monitoring the software engineering processes and methods used in a project to ensure proper quality of the software. Elaborate.

(3x10 marks = 30 marks)

PART C
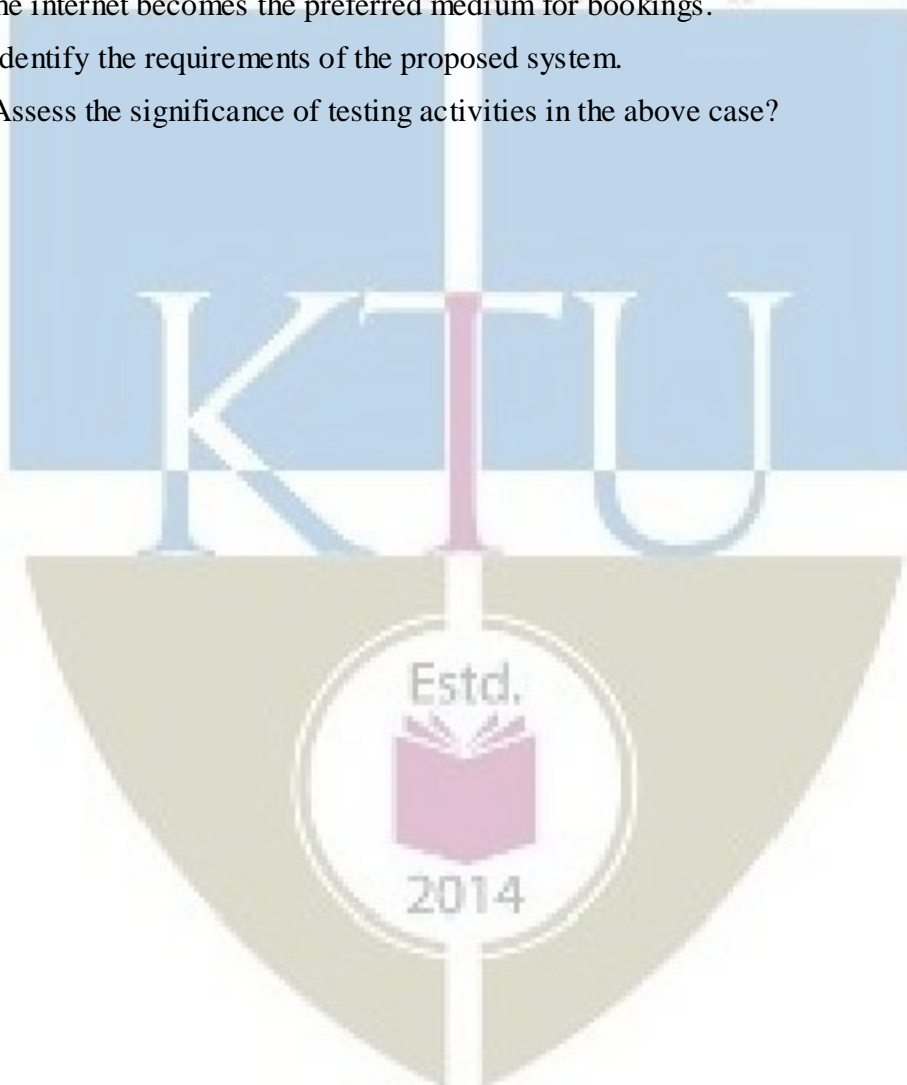Compulsory Question. This question carries 20 marks

11. **Canal Dreams Booking System Project Scenario**
    Canal Dreams is a major holiday company that specialises in canal holidays. The present organisation is the result of the acquisition of six regional canal boat leasing operators, as Canal Dreams has expanded over a number of years. Currently there is a central call centre that deals with holiday bookings using an in-house computer-based booking application, which is now some years old. Business development analysts have identified the need for an enhancement of the system so that customers can book boating holidays directly over the internet. One advantage of this is a possible increase in bookings by overseas customers. The current IT system was developed by an external software development company some time ago, and currently there are

two software developers who maintain the current system and implement relatively minor enhancements. However, the management of Canal Dreams does not believe that it has sufficient in-house resources to develop the new functionality, particularly as they see the required extension to the system as an urgent business need. The intention is therefore to contract out the system design and building of the system to an external company.

The main objective in this scenario is the enhancement of the Canal Dreams holiday booking system to allow potential customers to book holidays over the web. This will have business benefits for Canal Dreams. With the new system, potential customers can browse an online brochure of boats and start and finish locations, check if there is one available where and when they wish to go on holiday and, if available, make the booking – all via the internet. The new system will thus make booking possible 24 hours a day and seven days a week, and this improved accessibility, it is hoped, will increase sales. An automated online system should eventually allow staff reductions as the internet becomes the preferred medium for bookings.

1. Identify the requirements of the proposed system.   (10)

2. Assess the significance of testing activities in the above case?   (10)

Syllabus	
Module1	**Overview of Software Engineering:** Overview - Software and Software Engineering –Phases in Software Development – Software Development process, Models; Software Life cycle Models: Classical and Iterative Waterfall Model, Prototyping, Evolutionary Model, Spiral Model, Comparison of different life cycle models; Role of Management in Software Development–Software Quality Metrics; Professional software development; software engineering ethics; Agile software development.
Module 2	**Software Requirements Specification (SRS)** Role of SRS; Functional and non-functional requirements; the software requirements document; requirements specifications; requirements specification; requirements engineering processes; requirements elicitation and analysis; requirements validation; requirements management; Software Prototyping.
Module 3	**Planning and executing a software Project** Software Project Management- Project size estimation metrics, Line of Code (LOC), Function Point (FP). Project estimation techniques- empirical estimation techniques, Putnam's model, basic COCOMO model, Halstead's Software Science. Staffing Level Estimation, risk management, managing people, group, working, choosing and keeping people. Software cost estimation- software productivity, estimation of productivity, factors effecting programming productivity, project duration and staffing; Quality Assurance Plans–Project Monitoring Plans.
Module 4	**Software Design Concepts, Principles and Testing** Software Design, Design Process, Design Fundamentals, Modular Design, Data Design, Architectural Design, Procedural Design, Design Documentation. Software Testing Techniques and Technical Metrics - Software Testing Fundamentals, White Box Testing, Control Structure Testing, Black Box Testing, Testing Real Time System, Automated Testing.
Module 5	**Capability Maturity Model (CMM) for Software** Fundamentals, Five Maturity Levels, Key Process Areas, ISO9000 Series of Standards for Quality Management Systems, Mapping ISO9001 to the CMM - CMM Based Process Improvement. Software Quality Assurance- Fundamentals, Software Quality Assurance, Quality Concepts, Quality Movement, Reviews, Software Reliability, Background Issues, Software Quality Assurance Activities, SQA Plan.

Text Books

1. Ian Sommerville, *Software Engineering*, Pearson Education, 2013.
2. Pressman R.S., *Software Engineering: A Practitioner's Approach*, McGraw-Hill Higher Education, 2014.
3. Pankaj Jaiote, *An Integrated Approach to Software Engineering,* Narose Publishing House, 2005.

References and Suggested readings

1. Richard Fairly, *Software Engineering Concepts*, McGraw Hill Education India Private Limited, 2001.
2. Mall R., *Fundamentals of Software Engineering*, PHI Learning Private Limited-New Delhi, 2014.
3. Behferooz A. and Hudson F. J., *Software Engineering Fundamentals*, Oxford University Press, 1997.
4. Tory Dimes, *Scrum Essentials: Agile Software Development and Agile Project Management for Project.*
5. Sumit Prakash T, *Software Project Management,* Kindle Edition, University Science Press, 2011.
6. Mark C.P, *The Capability Maturity Model*, Amazon Publishing, 2015.
7. Carnegie Mellon University, *The Capability Maturity Model, Guidelines for Improving the Software Process*, Pearson Education,1995

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Overview of Software Engineering:**	
1.1	Overview - Software and Software Engineering – Phases in Software Development – Software Development process, Models	2 Hours
1.2	Software Life cycle Models: Classical and Iterative Waterfall Model, Prototyping, Evolutionary Model, Spiral Model, Comparison of different life cycle models; Role of Management in Software Development	2 Hours
1.3	Software Quality Metrics; Professional software development; software engineering ethics; Agile software development	3 Hours
2	**Software Requirements Specification (SRS)**	
2.1	Role of SRS; Functional and non-functional requirements; the software requirements document	2 Hours
2.2	Requirements specifications; requirements specification; requirements engineering processes; requirements elicitation and analysis	2 Hours
2.3	Requirements validation; requirements management; Software Prototyping.	3 Hours
3	**Planning and executing a software Project**	
3.1	Software Project Management- Project size estimation metrics, Line of Code (LOC), Function Point (FP). Project estimation techniques - empirical estimation techniques, Putnam's model, basic COCOMO model	2 Hours
3.2	Halstead's Software Science. Staffing Level Estimation, risk management, managing people, group, working, choosing and keeping people.	2 Hours
3.3	Software cost estimation- software productivity, estimation of productivity, factors effecting programming productivity, project	3 Hours

		duration and staffing; Quality Assurance Plans – Project Monitoring Plans	
4		**Software Design Concepts, Principles and Testing**	
	4.1	Software Design, Design Process, Design Fundamentals, Modular Design, Data Design, Architectural Design, Procedural design	2 Hours
	4.2	Design Documentation-Software Testing Techniques and Technical Metrics - Software Testing Fundamentals	2 Hours
	4.3	White Box Testing, Control Structure Testing, Black Box Testing, Testing Real Time System, Automated Testing	3 Hours
5		**Capability Maturity Model (CMM) for Software**	
	5.1	Fundamentals, Five Maturity Levels, Key Process Areas, ISO 9000 Series of Standards for Quality Management Systems, Mapping ISO 9001 to the CMM -CMM Based Process Improvement	2 Hours
	5.2	Software Quality Assurance - Fundamentals, Software Quality Assurance, Quality Concepts, Quality Movement, Reviews	3 Hours
	5.3	Software Reliability, Background Issues, Software Quality Assurance Activities, SQA Plan	3 Hours
		Total	36 Hrs