Bridge Course for Admission in MCA

The candidates who need to take admission in MCA need to complete minimum 72 credits in the courses of Computer Science prior to last date of application. The credits may be earned from list of prescribed MOOCs (from Swayam / NPTEL) / Online or Offline classes conducted by Chaudhary Ranbir Singh University, Jind and Affiliated Colleges. A candidate can opt maximum 4 MOOCs from one group. Credit earns from Swayam will be considered. The examinations for MOOCs will also be conducted by Chaudhary Ranbir Singh University, Jind, if request for the same is received by Controller of Examinations, Chaudhary Ranbir Singh University, Jind. Online / Offline Classes will be conducted by Chaudhary Ranbir Singh University, Jind and Affiliated Colleges. Classes may be conducted in evening session or in weekends.

The list of MOOCs of 4 Credit each is as under:

Group A

S.No.	Course Code	Name of Course	Max Marks	Min Marks	Credit
1.	BRA-CS-101	Fundamentals of Computer System	100	40	4
2.	BRA-CS-102	Introduction to Algorithm Design	100	40	4
3.	BRA-CS-103	Basic Electronics	100	40	4
4.	BRA-CS-104	Introduction to Information Technology	100	40	4
5.	BRA-CS-105	E-Commerce	100	40	4
6.	BRA-CS-106	Foundations of Cryptography	100	40	4

Group B

S.No.	Course Code	Name of Course	Max Marks	Min Marks	Credit
1.	BRB-CS-101	HTML Programming for Business : Web Design and Digital Literacy	100	40	4
2.	BRB-CS-102	Art of C Programming	100	40	4
3.	BRB-CS-103	Digital Electronics	100	40	4
4.	BRB-CS-104	Discrete Mathematics	100	40	4
5.	BRB-CS-105	Operating System	100	40	4
6.	BRB-CS-106	Software Engineering	100	40	4
7.	BRB-CS-107	Introduction to Cyber Security	100	40	4

Group C

S.No.	Course Code	Name of Course	Max Marks	Min Marks	Credit
1.	BRC-CS-101	Introduction to Information Retrieval	100	40	4
2.	BRC-CS-102	Indian Knowledge System :Concepts and Applications in Engineering	100	40	4
3.	BRC-CS-103	Introduction To Industry 4.0 And Industrial Internet Of Things	100	40	4
4.	BRC-CS-104	AI : Constraint Satisfaction	100	40	4
5.	BRC-CS-105	Understanding Data – Practical Foundation for Non Tech Learners	100	40	4
6.	BRC-CS-106	BlockChain and its Applications	100	40	4

Group D

S.No.	Course Code	Name of Course	Max Marks	Min Marks	Credit
1.	BRD-CS-101	Android Mobile Application Development	100	40	4
2.	BRD-CS-102	Web Based Technologies and Multimedia Applications	100	40	4
3.	BRD-CS-103	Data Structures	100	40	4
4.	BRD-CS-104	Theory of Computation	100	40	4
5.	BRD-CS-105	Data Base Management System	100	40	4
6.	BRD-CS-106	Information Security	100	40	4

Group E

S.No.	Course Code	Name of Course	Max Marks	Min Marks	Credit
1.	BRE-CS-101	Scripting Languages	100	40	4
2.	BRE-CS-102	Computer Networks and Internet Protocol	100	40	4
3.	BRE-CS-103	Design and Analysis of Algorithms	100	40	4
4.	BRE-CS-104	Cloud Computing	100	40	4
5.	BRE-CS-105	Artificial Intelligence	100	40	4
6.	BRE-CS-106	Introduction to Machine Learning	100	40	4
7.	BRE-CS-107	Software Reliability	100	40	4

BRA-CS-101 - Fundamentals of Computer System

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I:

Introduction to PC, basic components and types of computers, computer architecture, storage organization and storage hierarchy, data representation and memory units, input and output devices and their working mechanisms, software: system software, application software, utility software, operating systems and their functions.

Unit II:

Introduction to DBMS, database concepts and characteristics, advantages of DBMS over file system, DBMS architecture and data models, algorithms and their characteristics, steps in algorithm design, flowcharts and standard flowchart symbols.

Software engineering, software development life cycle (SDLC), software quality attributes, Waterfall model and its phases, Prototype model and its types.

Unit III:

Fundamentals of data communication, components of data communication system, data transmission modes, analog and digital signals, transmission media, communication devices: modem, hub, switch, router and gateway, basics of computer networks, types of networks, network topologies, introduction to OSI model and its layers.

Unit IV:

Introduction to information security, information security goals (confidentiality, integrity and availability), security threats and attacks, software vulnerabilities and their causes, common types of vulnerabilities, basics of network security, firewalls and intrusion detection systems, authentication concepts and methods, access control mechanisms, importance of security in computer networks.

Books and references

1. Hardware and Software: An Introduction (http://egyankosh.ac.in/handle/123456789/861)
2. Problem Solving Techniques(http://egyankosh.ac.in/handle/123456789/866)
3. Networking and Communication (http://egyankosh.ac.in/handle/123456789/614
4. Information Security(http://egyankosh.ac.in/handle/123456789/872)

Department of Computer Science and Applications, CRSU, Jind

BRA-CS-102 - Introduction to Algorithm Design

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I:

Definition and example of an algorithm, characteristics of an algorithm, steps in designing of algorithms, problem formulation (Tower of Hanoi), concept of efficiency and analysis of an algorithm, growth of function, asymptotic notations, comparative efficiencies of algorithms: linear, quadratic, polynomial and exponential.

Unit II:

Recurrence relations, substitution method, iteration method, master method, analysis of recursive algorithms, exponent evaluation, Euclid's algorithm for GCD, Horner's rule for polynomial evaluation, simple matrix ($n \times n$) multiplication.

Unit III:

Searching: linear search, binary search, Sorting: bubble sort, insertion sort, selection sort.

Unit IV:

Divide and Conquer, General issues in divide and conquer, merge sort, quick sort, analysis of divide and conquer algorithms.

Books and references

1. Introduction to Algorithms, T H Cormen, C E Leiserson, R N Rivest and C Stein; Prentice Hall of India, Latest Edition

BRA-CS-103 - Basic Electronics

Credit : 4

Time : 3 Hours

Min Pass Marks : 40

Max Marks : 100

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I:
Introduction to circuit elements, review of circuit laws (Ohm's Law, Kirchhoff's Laws), network theorems (Thevenin's, Norton's, Superposition), semiconductor diodes: types, biasing techniques and applications.

Unit II:
Bipolar Junction Transistor (BJT): symbols, construction, configurations (CE, CB, CC) and characteristics, biasing techniques of BJT, construction and working of small signal amplifiers, introduction to operational amplifiers (OP-AMPs), characteristic features of OP-AMPs, mathematical operations and applications.

Unit III:
Number systems, digital codes and interconversions, logic gates, Boolean algebra, presentation and simplification of combinational logic expressions, Karnaugh maps.

Unit IV:
Adders, multiplexers and demultiplexers, encoders and decoders, construction and evaluation of flip-flops, timing (time-out) diagrams, construction and applications of digital counters, construction and applications of shift registers.

Books and references

1. Principles of Electronic Devices and Circuits, B.L. Thereja and R.S. Sedha, S. Chand Publications, ISBN 9788121921992
2. Schaum's Outline of Electronic Devices and Circuits, Jimmie Cathey, 2nd Edn, McGraw Hill Publishers 9780071362702
3. Basic Electronics for Scientists and Engineers, Dennis L Eggleston, Cambridge University Press, ISBN 9781107696785
4. Digital fundamentals, Thomas L. Floyd, Pearson Publications, 9789332584600
5. Op-Amps and Linear Integrated Circuits, Ramakant A Gayakwad, Pearson Publications, 978-9332549913
6. Schaum's Outline of Digital Principles, Roger L. Tokheim, 3rd Edn, McGraw Hill Publishers, 978-0070650503

BRA-CS-104 - Introduction to Information Technology

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I:
Foundations of Information Technology, Attributes of Information Technology, Information and Communication Technology (ICT), Digital Divide, Cyberspace, Cybercrime and its impact.

Unit II:
Applications of Information Technology, E-commerce concepts and models, E-Governance systems, IT in educational systems, IT in medical systems.

Unit III:
Development of Information Systems, System Development Life Cycle for Information Systems, Management Information Systems (MIS), IT projects in India and their impact.

Unit IV:
Fundamentals of Embedded Systems, advanced methods of communication with computers, introduction to Computer Vision and its applications.

Books and references

1. Elements of Information Technology: http://www.egyankosh.ac.in/handle/123456789/884
2. IT in Action: http://www.egyankosh.ac.in/handle/123456789/885
3. Information Systems: http://www.egyankosh.ac.in/handle/123456789/893
4. State of the art practices in Information Technology: http://www.egyankosh.ac.in/handle/123456789/896

BRA-CS-105 - E Commerce

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I:

Introduction to E-commerce, evolution and scope of E-commerce, E-commerce models (B2B, B2C, C2C, C2B), designing, building and launching an E-commerce website, essential components of an online store.

Unit II:

E-payment systems, digital payment gateways, electronic fund transfer mechanisms, The Art of E-commerce (customer experience, branding and user engagement), online marketing and advertising strategies, social media and search engine marketing.

Unit III:

E-commerce supply chain management, logistics and order fulfillment, secure E-commerce practices, protecting business and customers, data privacy, global E-commerce and strategies for expanding business beyond borders.

Unit IV:

E-commerce analytics and data-driven decision making, performance metrics and KPIs, emerging E-commerce trends and innovations, case studies in global E-commerce.

Books and references

1. Bhasker, B. (2013). Electronic commerce: framework, technologies and applications. Tata McGraw-Hill Education.

2. Pralok Gupta (29 July-2020) E-Commerce in India: Economic and Legal ,1st Edition, New Delhi, India. SAGE Publications India Pvt Ltd.

3. Wiedong Kou (2003) Payment Technologies for e-commerce,1st Edition, Springer- VerlagBerlin Heildelberg.

4. Bharat Bhasker, (July 2017) Electronic Commerce: Framework, Technologies and Applications, 4th Edition, McGraw Hill Education.

5. Jackson, P. J., Harris, L., & Eckersley, P. M. (Eds.). (2003). E-business fundamentals. Psychology Press.

6. Pralok Gupta (29 July-2020) E-Commerce in India: Economic and Legal ,1st Edition, New Delhi, India. SAGE Publications India Pvt Ltd.

BRA-CS-106 - Foundations of Cryptography

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Symmetric-key Encryption, Historical Ciphers, Perfect Security and Its Limitations
Computational Security, Semantic Security and Pseudorandom Generators (PRGs)
Stream Ciphers, Provably-secure Instantiation of PRG, Practical Instantiation of PRG, CPA-security and Pseudo-random Functions (PRFs)

Unit II

CPA-Secure Ciphers from PRF, Modes of Operations of Block Ciphers, Theoretical Constructions of Block Ciphers and Practical Constructions of Block Ciphers
DES, AES and Message Authentication Codes (MAC)
Information-theoretic Secure MAC, Cryptographic Hash Functions, Ideal-Cipher Model, Davies-Meyer construction and Merkle-Damgård Paradigm

Unit III

Birthday Attacks on Cryptographic Hash Functions, Applications of Hash Functions, Random Oracle Model and Authenticated Encryption Generic Constructions of Authenticated Encryption Schemes, Key-exchange Problem, One-way Trapdoor Functions and Cyclic Groups
Discrete-Logarithm Problem, Computational Diffie-Hellman Problem, Decisional Diffie-Hellman Problem, Elliptic-Curve Based Cryptography and Public-Key Encryption

Unit IV

El Gamal Encryption Scheme, RSA Assumption, RSA Public-key Cryptosystem, KEM-DEM Paradigm and CCA-security in the Public-key Domain
CCA-secure Public-key Hybrid Ciphers Based on Diffie-Hellman Problems and RSA-assumption, Digital Signatures, RSA Signatures and Schnorr Identification Scheme
Schnorr Signature, Overview of TLS/SSL, Number Theory, Interactive Protocols and Farewell

Books and References

1. Introduction to Modern Cryptography by Jonathan Katz and Yehuda Lindell
2. Cryptography Theory and Practice by Douglas Stinson

BRB-CS-101 - HTML Programming for Business: Web Design and Digital Literacy

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Basics of HTML for Business Websites, Enhancing Business Websites with Forms & Multimedia, Applying CSS for Branding & Design

Unit II

Responsive Design for Business Websites, Adding Interactivity with Basic JavaScript

Unit III

Enhancing Business Websites with Search Engine Optimization, Mini Project-Website Deployment & Social Media Integration

Unit IV

Digital Strategy for Effective Web Presence, Industry Insights and Future Trends

Books and references

1. Duckett, J. (2011). HTML and CSS: Design and build websites. Wiley. ISBN: 978-1-118-00818-8.
2. Freeman, E., & Freeman, E. (2005). Head First HTML with CSS & XHTML. O'Reilly Media. ISBN: 978-0-596-10197-8.
3. Meloni, J. C. (2014). HTML, CSS, and JavaScript all in one (3rd ed.). Sams Publishing.
4. Freeman, E., & Robson, E. (2012). Head first HTML and CSS: A learner's guide to creating standards-based web pages (2nd ed.). O'Reilly Media. ISBN: 978-0-596-15990-0.
5. Flanagan, D. (2020). JavaScript: The definitive guide (7th ed.). O'Reilly Media. ISBN: 978-1-4919-5202-3
6. Kogent Learning Solutions Inc. (n.d.). Web technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and Ajax (Black Book). Dreamtech Press.

BRB-CS-102 - Art of C Programming

Credit : 4

Time : 3 Hours

Min Pass Marks : 40

Max Marks : 100

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Problem Solving Using Flowchart, Algorithm Design, Programming Concepts

Unit II

C-Fundamentals: Manipulating Data, Operators and Expressions. Input and Output in C, Storage Classes of Variables in C, Control Instructions in C: Conditional Control, Loop Control, Switch-Case, goto statement

Unit III

C Programming with Arrays, 1 D array, 2 D array, Multi dimensional array, Functions in C, Call by value and call by reference, recursion.

Unit IV

Pointers in C, Structure and Unions in C, File Management C

Books and references

1. B. W. Kernighan and D. M. Ritchie, The C Programming Language, Prentice-Hall, Englewood Cliffs, New Jersey, 1978.
2. Greg Perry, Absolute Beginners' Guide to C 2nd Edition, SAMS publishing, A division of prentice Hall Computer Publishing, April 1994.
3. Yashavant Kanetkar; Let us C, BPB Publications, New Delhi.
4. C in Depth by Deepali Srivastava and 4. S. K. Srivastava.
5. C Programming: A Modern Approach, 2nd Edition by K. N. King.

BRB-CS-103 - Digital Electronics

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I
Number Systems & Boolean Algebra, Logic Gates, Boolean expressions and simplification of expressions

Unit II
Combinational Logic Circuits- Half Adder, Full Adder, Subtractor, MuX, DeMuX, Decoder, Encoder

Unit III
Sequential Logic Circuits, Flip Flop, Registers, Counters

Unit IV
Memory Devices, RAM, ROM and its types.

Books and references

1. Digital principles & Applications, Albert Paul Malvino & Donald P. Leach, McGraw Hill Education; Eighth edition. ISBN: 978-9339203405
2. Digital Electronics, Roger L. Tokheim Macmillian McGraw-Hill Education (ISE Editions); International 2 Revised ed edition. ISBN: 978-0071167963
3. Digital Electronics – an introduction to theory and practice, William H. Gothmann Prentice Hall India Learning Private Limited; 2 edition. ISBN: 978-8120303485
4. Fundamentals of Logic Design, Charles H. Roth Jr.Jaico Publishing House; First edition. ISBN: 978-8172247744
5. Digital Electronics, R. Anand Khanna Publications, New Delhi (Edition 2018). ISBN: 978-93-82609445

BRB-CS-104 - Discrete Mathematics

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I
Counting, Set Theory, Logic, Propositional, Disjunction, Conjunction, Predicate logic, Quantifiers.

Unit II
Relations, equivalence relation, partial order relation, Hasse Diagram, lattice, Functions and types.

Unit III
Graph Theory, Traversal of Graph, Euler Graph, Hamiltonian Graph and Generating Functions

Unit IV
Principle of Inclusion-Exclusion, Mathematical Induction and Pigeonhole Principle Recurrence relations, Advanced Topics

Books and references
1. Discrete and Combinatorial Mathematics by Ralph P Grimaldi
2. Discrete Mathematics and its Applications by Kenneth H Rosen

BRB-CS-105 - Operating System

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction of operating systems, components of operating system, Basics of I/O operation, Multi-processing, System calls, Inter-process communication, system booting process, Open source OS
Register, Address binding, Swapping, Allocation, Advanced Memory Management (Copy-on-Write, kernel memory allocation, memory compression)

Unit II

Process management- Process state, Process Scheduling, IPC systems, process synchronization, critical Section, Realtime scheduling, Threads
Deadlock, detection, Avoidance, Banker's Algorithms, Deadlock example and explanation of resource allocation graph

Unit III

CPU Scheduler, dispatcher scheduling algorithm, Storage Management- Paging, Virtual memory management ,Page replacement and segmentation, swap space management
File Concepts, structures, types and its access methods, Disk Structure and file Sharing and protection, Disk scheduling.

Unit IV

File system Implementation, Directory Implementation, File Allocation Table, Free space management, Virtual file system, remote file system
I/O hardware, I/O interface, Kernel I/O subsystem, I/O streams, Domain Structure and Access matrix Case study – windows OS Case study- Linux / Unix Sample programming concepts in Linux / Unix (shell scripting)

Books and references

1) A. Silberschatz P.B. Galvin, G.Gagne, 2012, Operating System Concepts, 8th Edn., John Wiley & Sons, Inc.
2) D.M. Dhamdhare , 2012, Operating Systems: A Concept Based Approach, 3rd Edn.Tata McGraw-Hill, New Delhi.
3) A.S. Tanenbaum, H. Bos ,2014, Modern Operating Systems, 4th Edn, Prentice-Hall of India, New Delhi

BRB-CS-106 - Software Engineering

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I
Foundations- Introduction to Software Engineering, Overview of Software Processes, Agile Methodologies and Principles, Software Development Life Cycle (SDLC)

Unit II
Process Models & Requirements-Detailed Study of Waterfall and Incremental Models, Comparative Analysis of Life Cycle Models, Requirement Engineering Processes, Crafting Software Requirement Specifications (SRS)

Unit III
Planning & Design- Software Project Planning Techniques, Introduction to Function Point Analysis, Principles of Modular Design, Understanding Cohesion and Coupling

Unit IV
Design Techniques - Design Notations and Their Applications, Design Metrics, Creating and Interpreting Data Flow Diagrams, System Analysis Techniques, Creating and Understanding Design Diagrams

Books and references

1. R. S. Pressman, *Software Engineering: A Practitioner's Approach*, 8th ed. New York, NY, USA: McGraw-Hill, 2015.
2. P. Jalote, *Software Engineering: A Precise Approach*. New York, NY, USA: Springer, 2010.
3. R. Fairley, *Software Engineering Concepts*. New York, NY, USA: McGraw-Hill, 1997.
4. Ko, *Co-operative Software Development*. Seattle, WA, USA: Univ. of Washington, 2023. [Online]. Available: https://faculty.washington.edu/ajko/books/csd
5. Fox and D. Patterson, *Engineering Software as a Service: An Agile Approach Using Cloud Computing*, 2nd ed. Strawberry Canyon, CA, USA: Strawberry Canyon LLC, 2020.

BRB-CS-107- Introduction to Cyber Security

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction to Cyber Space, History of Internet Cyber Crime, Information Security Computer Ethics and Security Policies, Choosing the Best Browser according to the requirement and email security, Guidelines to choose web browsers, Securing web browser Antivirus, Email security

Unit II

Guidelines for secure password and wi-fi security, Guidelines for setting up a Secure password, Two-steps authentication, Password Manager, Wi-Fi Security, Guidelines for social media and basic Windows security, Guidelines for social media, Tips and best practices for safer Social Networking, Basic Security for Windows, User Account Password

Unit III

Smartphone security guidelines, Introduction to mobile phones, Smartphone Security, Android Security, IOS Security, Cyber Security Initiatives in India, Counter Cyber Security Initiatives in India, Cyber Security Exercise, Cyber Security Incident Handling, Cyber Security Assurance

Unit IV

Online Banking, Credit Card and UPI Security, Online Banking Security, Mobile Banking Security Security of Debit and Credit Card UPI Security.

Micro ATM, e-wallet and POS Security, Security of Micro ATMs, e-wallet Security Guidelines, Security Guidelines for Point of Sales (POS)

Books and references

1. Introduction to Cyber Security available at http://uou.ac.in/foundation-course
2. Fundamentals of Information Security https://www.uou.ac.in/progdetail?pid=MSCCS-18
3. Cyber Security Techniques https://www.uou.ac.in/progdetail?pid=MSCCS-18
4. Cyber Attacks and Counter Measures: User Perspective https://www.uou.ac.in/progdetail?pid=MSCCS-18
5. Information System https://www.uou.ac.in/progdetail?pid=MSCCS-18

BRC-CS-101- Introduction to Information Retrieval

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction, Text processing, Document Representation, Tokenization, Term filtering, Term Document Incidence Matrix, Boolean Retrieval, Inverted Index, query processing, optimization, skip pointers
Inverted Index, Storing the index, BSBI, SPIMI, Zipf's and Heaps' Law, Dictionary compression, Postings Compression

Unit II

Getting started with PyLucene - Indexing, Lucene Document and Field Options
Indexing Wiki Movies, Non-English Text Analysis, Luke - Index viewer, Different options in Indexing, PyLucene Practice Programming
Ranked Retrieval, Jaccard Similarity, Term Frequency, Scaling TF, TF-IDF weighting, Inner product, Euclidean Distance and their problem, Cosine Similarity, VSM Algorithm, SMART Notation
VSM Problem Solving, Probabilistic Model - Introduction, Probability Ranking Principle, BIM for ranked retrieval, BM1, BM11, BM15, BM25, Dissecting BM25, BM25 vs VSM, BM25 for long queries, BM25F, BM25+, Why BM25 is still relevant?

Unit III

Language Model for Information Retrieval, Unigram Language Model, Estimating Document Language Model, Zero Frequency Problem and Introduction to Smoothing, Jelinek-Mercer and Dirichlet Smoothed Language Model, Comparing Smoothing with IDF and Summary of LM-based Retrieval
Using KLD, JSD in Information Retrieval, PyLucene - Retrieval, PyLucene - Various Query Classes - TermQuery, PhraseQuery, TermRangeQuery, Numerical Range Query, PyLucene - Various Query Classes - PrefixQuery, BooleanQuery, WildcardQuery, FuzzyQuery, MatchAllDocsQuery

Unit IV

Evaluation - Set-based evaluation metrics, Precision, Recall, F measure, Precision at K, R-Prec, Incorporating Ranking in Precision and Recall, AP, MAP, GMAP, MRR, Graded relevance, nDCG, Hypothesis Testing, Role of Evaluation Forums, Kappa measure
Indexing and Retrieval of Benchmark Datasets, Indexing and Retrieval in TREC-like Benchmark Datasets, Evaluation using `TREC_EVAL`, Hypothesis testing in IR, Relevance Feedback - Rocchio, RLM

Books and references

1.Introduction to Information Retrieval C. Manning, P. Raghavan and H. Schutze https://nlp.stanford.edu/IR-book/information-retri eval-book.html
2.Information Retrieval: Implementing and Evaluating Search Engines S. Buttcher, C. L. A. Clarke, G. Cormack.

BRC-CS-102- Indian Knowledge System :Concepts and Applications in Engineering

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I
Indian Knowledge System & Vedic Corpus- Significance of Indian Knowledge System, Characteristics and knowledge traditions
Vedic Corpus: Rigveda, Yajurveda, Samaveda, Atharvaveda, Brahmanas, Aranyakas, Upanishads, Oral tradition and preservation methods

Unit II
Number System, Mathematics & Astronomy, Evolution of number system and concept of zero
Decimal system and units of measurement, Contributions of Aryabhata, Brahmagupta, Bhaskara II
Arithmetic, algebra, trigonometry
Astronomical concepts: planetary motion, eclipses, calendar

Unit III
Engineering & Technology- Metallurgy: iron, steel, alloys, metalworking techniques, Case studies: Iron Pillar, Wootz steel
Water management systems, Textile and craft technologies, Shipbuilding and transportation

Unit IV
Architecture, Knowledge Systems & Linguistics, Town planning: Mohenjo-daro, Harappa
Urban design: drainage, grid system, construction, Knowledge classification: Vedas, Vedangas, Upavedas
Linguistics: Panini and Sanskrit grammar, Relevance to modern computing and language systems

Books and references

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.

Additional Readings:

- Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
- Sampad and Vijay (2011). "The Wonder that is Sanskrit", Sri Aurobindo Society, Puducherry.
- Bag, A.K. (1979). Mathematics in Ancient and Medieval India, Chaukhamba Orientalia, New Delhi.
- Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
- Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205–221.
- Subbarayappa, B.V. and Sarma, K.V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
- Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.

- Acarya, P.K. (1996). Indian Architecture, Munshiram Manoharlal Publishers, New Delhi.
- Banerjea, P. (1916). Public Administration in Ancient India, Macmillan, London.
- Kapoor Kapil, Singh Avadhesh (2021). "Indian Knowledge Systems Vol – I & II", Indian Institute of Advanced Study, Shimla, H.P.

BRC-CS-103- Introduction to Industry 4.0 And Industrial Internet Of Things

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction: Sensing & actuation, Communication-Part I, Part II, Networking-Part I, Part II, Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories, Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis

Cybersecurity in Industry 4.0, Basics of Industrial IoT: Industrial Processes-Part I, Part II, Industrial Sensing & Actuation, Industrial Internet Systems.

Unit II

IIoT-Introduction, Industrial IoT: Business Model and Referece Architerture: IIoT-Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II.

Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II, IIoT Communication-Part I.

Industrial IoT- Layers: IIoT Communication-Part II, Part III, IIoT Networking-Part I, Part II, Part III.

Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science - Part I, Part II, R and Julia Programming, Data Management with Hadoop.

Big Data Analytics and Software Defined Networks: SDN in IIoT-Part I, Part II, Data Center Networks, Security and Fog Computing: Cloud Computing in IIoT-Part I, Part II.

Unit III

Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT-Part I, Part II,

Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry.

Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries

Unit IV

Real case studies :

Case study - I : Milk Processing and Packaging Industries

Case study - II: Manufacturing Industries - Part I

Case study - III : Manufacturing Industries - Part II

Case study - IV : Student Projects - Part I

Case study - V : Student Projects - Part II

Case study - VI : Virtual Reality Lab

Case study - VII : Steel Technology Lab

Books and references

1) S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press. Availability:https://www.amazon.in/Introduction-IoT-Sudip-Misra/dp/1108959741/ref=sr_1_1?dchild=1&keywords=sudip+misra&qid=1627359928&sr=8-1

2) S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press. Availability:https://www.amazon.in/dp/1032146753/ref=sr_1_3?dchild=1&keywords=sudip+misra&qid=1627359971&sr=8-3

BRC-CS-104 - AI : Constraint Satisfaction

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Module 1: Constraint satisfaction problems (CSP), examples.
Module 2: Constraint networks, equivalent and projection networks.

Unit II
Module 3: Constraint propagation, arc consistency, path consistency, i-consistency.
Module 4: Directional consistency and graph ordering, backtrack free search, adaptive consistency.

Unit III
Module 5: Search methods for solving CSPs, lookahead methods, dynamic variable and value ordering.
Module 6: Lookback methods, Gaschnig's backjumping, graph based backjumping, conflict directed back jumping. Combing lookahead with lookback, learning.

Unit IV
Module 7: Model based systems, model based diagnosis, truth maintenance systems, planning as CSP. Wrapping up.

Books and references
1. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.
2. Rina Dechter, Constraint Processing, Morgan Kaufmann, 2003.

BRC-CS-105- Understanding Data – Practical Foundation for Non Tech Learners

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Understanding Data in the Modern World- Data concepts, types of data, data sources, data generation, data in business, data in industry, data-driven decision making

Unit II

Data Life Cycle and Data Collection- Data life cycle stages, data generation, data collection methods, structured data, unstructured data, data storage, data processing, data disposal, data quality, data integrity

Unit III

Data Analysis and Statistical Thinking- Data analysis steps, data cleaning, data transformation, data visualization, Statistical Thinking, probability, variability, data interpretation

Unit IV

Data Governance, Ethics and Decision-Making- Data governance, data policies, data standards, data security, data privacy, data ethics, transparency, accountability, decision-making process

Books and references

1. Bergstrom, C. T., & West, J. D. (2020). Calling bullshit: The art of skepticism in a data-driven world. Random House.
2. D'Ignazio, C., & Klein, L. F. (2020). Data feminism. MIT Press. https://data-feminism.mitpress.mit.edu/
3. GDPR.eu. (n.d.). GDPR: Key principles and rights. https://gdpr.eu/what-is-gdpr/
4. Knaflic, C. N. (2015). Storytelling with data: A data visualization guide for business professionals (Chapters 1–3). Wiley.

BRC-CS-106- BlockChain and its Applications

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I
Introduction to Blockchain Technology and its Importance, Basic Crypto Primitives Cryptographic Hash, Digital Signature

Unit II
Evolution of the Blockchain Technology, Elements of a Blockchain, Blockchain Permissionless Models, Permissioned Models, Constorium Models

Unit III
Ethereum Smart Contracts (Permissionless Model), Hyperledger Fabric (Permissioned Model)

Unit IV
Decentralized Identity Management, Blockchain Interoperability, Blockchain Applications

Books and references

1. Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, 3rd Edition, Imran Bashir, Packt Publishing,2020,ISBN:9781839213199,book
website:https://www.packtpub.com/product/mastering-blockchain-thirdedition/9781839213199
2. Hyperledger Tutorials - https://www.hyperledger.org/use/tutorials
3. Ethereum Development Resources - https://ethereum.org/en/developers
4. Online materials and case studies

BRD-CS-101- Android Mobile Application Development

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Android Software Development, building a sample Android application using Android Studio, Android Project Structure, Android Manifest File and its common settings.

Unit II

Activities, Services, Intents, Permissions, Application resources, Basic User Interface Screen elements, Designing User Interfaces with Layouts.

Unit III

Using Content Providers, Handling Persisting Data, JSON Web Service

Unit IV

Gallery, drawing 2D and 3D Graphics and Multimedia, Drawing and Working with Animation, Networking, Telephony and Location, Android Networking, Web and Telephony API.

Books and References

1. PGDMAD-103: Android Mobile Application Development, ISBN-978-81-940577-2-7 June 2019 by Dr. Babasaheb Ambedkar Open University.
2. PGDMAD-105: Software Lab for Android Mobile Application Development, ISBN-978-81-940577-4-7 June 2019 by Dr. Babasaheb Ambedkar Open University.
3. PGDMAD-201: Advanced Android Mobile Application, ISBN-978-81-940577-5-8 by Dr. Babasaheb Ambedkar Open University.
4. PGDMAD-203: Software Lab for Advanced Android Mobile Application, ISBN-978-81-940577-7-2 by Dr. Babasaheb Ambedkar Open University.

References

1. Https://developer.android.com.
2. Wireless Communications & Networks, Second Edition, William Stallings by Pearson.
3. Mobile Computing Technology, Applications and service creation, Asoke K Telukder, Roopa R Yavagal by TMH.
4. Android Application Development Black Book, Pradeep Kothari, dreamtech press.
5. Wireless and mobile networks, Dr. Sunilkumar S. Manvi, Dr. Mahabaleshwar S.Kakkasageri by WILEY.
6. Wireless networks, P. Nicopolitidis, M. S. Obaidat, G.I. Papadimitriou, A.S. Pomportsis by WILEY.
7. Mobile Computing, Raj Kamal by Oxford.
8. Mobile Computing Theory and Practice-Kumkum Garg- Pearson.

BRD-CS-102- Web Based Technologies and Multimedia Applications

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Internet : An Overview, Concepts of Web Browser, Internet Search, What can we do using Internet

Unit II

Introduction to HTML, Tools for Web Page Designing, Designing of Frames and Forms

Unit III

An Overview of Multimedia, Multimedia Design, Production and Distribution, Applications of Multimedia, Distributed Environment

Unit IV

Multimedia Authoring Tools

Books and References

1. http://www.egyankosh.ac.in/handle/123456789/618

BRD-CS-103- Data Structures

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction of Data Structures, Arrays, Stacks and Its Application, Queues, Implementation of Queues,

Trees, and Tree Traversals, Binary Tree Representation & Binary Tree Traversal,

Unit II

Binary Search Trees - Searching & Insertion, and Deletion

Balanced Trees, Balanced Trees - Insertion, and AVL Trees, Graphs, Graph Traversals, and Shortest Path

Unit III

Types of Sorting, Heap Sort and Hashing, Sorting, Selection Sort and Bubble Sort, Insertion Sort, Quick Sort Algorithm, and Kruskal's MST Algorithm, Bucket Sort, Radix Sort, and Merge Sort

Unit IV

File Organisation, External Sorting, B Tree and B+ Tree - Insertion & Deletion

Books and References

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++" (2007), Second Edition, Pearson Education.
2. Cormen, Leiserson and Rivest, "Introduction to Algorithms" (2022), Fourth Edition, MIT Press.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms" (1983), Pearson Education.
4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures in C++ " (1993).

BRD-CS-104- Theory of Computation

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction to the course, DFAs, Regular Languages, Regular operations, Closure under union NFAs, Equivalence of DFAs and NFAs, Closure properties, regular expressions, Equivalence of Regular expressions and DFAs.

Pumping Lemma for regular languages, Myhill-Nerode Theorem,

Unit II

Context-free grammars, Chomsky Normal Form, CYK Algorithm, Closure properties of CFLs, Pushdown Automata, Equivalence of PDAs and CFGs,

Unit III

Pumping Lemma for CFLs, Introduction to Turing machines, Decidable (recursive) languages, Turing-Recognizable (recursively enumerable) languages, Multi-tape TMs, NTMs, Equivalence, Church Turing thesis

Unit IV

Decidable languages from regular and context-free languages, Countable and uncountable sets,Halting Problem and undecidability. Reductions. Decidable and undecidable languages using reductions. Rice's theorem. Computation Histories.

Post Correspondence Problem (PCP) is undecidable, Introduction to Complexity Theory. Asymptotic notation, Classes P and NP.

Books and references

1. Introduction to the Theory of Computation by Michael Sipser
2. Introduction to Automata Theory, Languages and Computation by John E. Hopcroft and Jeffrey D. Ullman.

BRD-CS-105- Data Base Management System

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction to RDBMS, Structured Query Language (SQL), Relational Algebra.

Unit II

Entity-Relationship Model, Relational Database Design, Application Development.

Unit III

Storage and File Structure, Indexing and Hashing. Query Processing, Query Optimization.

Unit IV

Transactions (Serializability and Recoverability), Concurrency Control. Recovery Systems. Course Summarization.

Books and references

1. Database System Concepts by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, 6th Edition, McGraw-Hill Education, 2010.

BRD-CS-106- Information Security

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Information Security, Network Security, Computer Network Reference Models, TCP/IP Reference Model, Protocol Stack, Transmission Control Protocol

Unit II

IPV4 & IPV6, UDP - User Datagram Protocol, IPSec Security Protocol, Animated Cursor Vulnerability - Proof of Concept

Unit III

Email Security Protocols, WWW Security, Mobile Code Security, Ethernet Security

Wi-Fi Security Protocol, Bluetooth Networks and Security Protocols, WiMAX Technology and its Security

Unit IV

Cloud Computing Security, 4G LTE and 5G Network Security, VoIP Protocols, Introduction to DDoS, Defence to DDos Attacks

Books and References

1. Bishop, M. (2003). Computer Security: Art and Science (1st ed.). Addison-Wesley. ISBN 0-321-13450-9
2. Biswal, B. (2011). Information Security: A Practical Approach to Securing Corporate Information Systems in India (1st ed.). Excel Books. ISBN 978-81-7446-870-3
3. Joshi, S., & Gupta, A. (2019). Cyber Security in India: Challenges, Practices and Solutions (1st ed.). Wiley India. ISBN 978-81-265-4385-8
4. Kumar, P., & Choudhary, P. (2015). Network Security and Cyber Laws in India (1st ed.). Tata McGraw-Hill Education. ISBN 978-0-07-070165-9
5. Pfleeger, C. P., & Pfleeger, S. L. (2012). Security in Computing (4th ed.). Prentice Hall. ISBN 978-0-13-239077-0
6. Stallings, W. (2017). Cryptography and Network Security: Principles and Practice (7th ed.). Pearson. ISBN 978-0-13-444428-4
7. Whitman, M. E., & Mattord, H. J. (2018). Principles of Information Security (6th ed.). Cengage. ISBN 978-1-305-55656-2

BRE-CS-101- Scripting Languages

Time : 3 Hours

Credit : 4

Max Marks : 100

Min Pass Marks : 40

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction, Variables and Data Types (Numeric and String): Introduction to Programming and Scripting language, Python-History, Features, Setting up path, Installation and Working with Python, Basic Syntax, interactive shell, IDLE, Understanding Python variables, comments in the program, Numeric data types, Using string data type and string manipulations: subscript operator, indexing, slicing a string. Operators and Other Data Types (Tuples and Dictionary): Basic Operators, Understanding coding blocks, Defining list and list slicing, Other Data Types: Tuples, Dictionary.

Unit 2

Control Structures: Conditional blocks using if, else and elif, For loops and iterations, while loops. Continuation of Control Structures: Loop manipulation using continue, break and pass, Programming using conditional and loops block.

Unit 3

Functions and Modules: Organizing Python codes using functions, Organizing Python projects into modules, Continuation of Modules and Packages: Importing own module as well as external modules, Understanding Packages.

Unit 4

File I/O, Text Processing, Regular Expressions: Understanding read functions, Understanding write functions, Programming using file operations, Powerful pattern matching and searching, Power of pattern searching using regex.

Books and References

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.
6. Beginning Python using Python 2.6 and Python 3, James Payne, Wrox publishing
7. Practical Programming: An Introduction to Computer Science using Python 3, Paul Gries, The Pragmatic Bookshelf

BRE-CS-102- Computer Networks and Internet Protocol

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction to Computer Networks – History, Circuit Switching and Packet Switching, TCP/IP Protocol Stack – Basic Overview, Application Layer Services (HTTP, FTP, Email, DNS),

Unit II

Transport Layer Primitives – Connection Establishment and Closure, Flow Control and Congestion Control at the Transport Layer, Transmission Control Protocol – Basic Features, TCP Congestion Control,

Unit III

Network Layer Primitives – IP Addressing, IP Routing – Intra Domain Routing Protocols, Inter Domain Routing Protocols (BGP), IP Services – SNMP, ARP

Unit IV

Data Link Layer Service Primitives – Forwarding, Flow Control, Error Control, Media Access Control - Channel Access Protocols, Framing, End to End Principles of Computer Networks

Books and References

1. Computer Networking: A Top - Down Approach, by Ames Kurose, Keith Ross
2. Computer Networks - Andrew S Tanenbaum
3. Computer Networks: A Systems Approach Book by Bruce S. Davie and Larry L. Peterson
4. TCP/IP Tutorial and Technical Overview, (IBM Redbook) - Download From http://www.redbooks.ibm.com/abstracts/gg243376.html
5. TCP/IP Guide, Charles M. Kozierok, Available Online - http://www.tcpipguide.com/
6. Request for Comments (RFC) - IETF - http://www.ietf.org/rfc.html

BRE-CS-103- Design and Analysis of Algorithms

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Algorithm Basics, Complexity of Algorithms, Useful Mathematical Functions & Notations, Asymptotic Notations of Algorithm Complexity, Analysis of Simple Algorithm, Analysis of Exponent Evaluation, Analysis of a Sorting Algorithm

Introduction to Recurrence Relation, Solving Recurrence Relation: Substitution Recursion Tree Method Master Method of Solving Recurrence

Unit II

Greedy Techniques, Fractional Knapsack Problem, Huffman Codes

Divide & Conquer Techniques: Merge Sort, Quick Sort, Integer Multiplication, Matrix Multiplication, Graph Representation and Traversal, Topological Ordering, Strongly Connected Components

Minimum Cost Spanning Tree: Kruskal's Algorithm, Prim's Algorithm

Shortest Path: Dijkstra's Algorithm, Bellman – Ford Algorithm, Floyd Warshall Algorithm

Unit III

Maximum Bipartite Matching, Principle of Optimality and Matrix Chain Multiplication, Optimal Binary Search Tree, Binomial Coefficient Computation, String Matching Algorithm, Knuth-Morris-Pratt Algorithm

Unit IV

P and NP Class of Problem, NP Complete Problem, Some NP Complete Problem Definitions, Proving NP Completeness, Some NP Complete Decision Problem, Backtracking Problem, Branch and Bound Problem, Approximation Algorithms

Books and references

1. "Introduction to Algorithms" T H Cormen, C E Leiserson, R N Rivest and C Stein; Prentice Hall of India, Latest Edition

BRE-CS-104- Cloud Computing

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction to Cloud Computing, Cloud Computing Architecture, cloud deployment models, Service models

Unit II

Service Management in Cloud Computing, Data Management in Cloud Computing, Resource Management in Cloud

Unit III

Cloud Security, Open Source and Commercial Clouds, Cloud Simulator, Research trend in Cloud Computing

Unit IV

Fog Computing, VM Resource Allocation, Management and Monitoring, Cloud-Fog-Edge enabled Analytics, Serverless Computing and FaaS Model, Case Studies and Recent Advancements

Books and references

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010

BRE-CS-105- Artificial Intelligence

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Definition of AI, Turing Test, History of AI, Problem-Solving and Search Strategies, Heuristic Techniques: A*, Greedy Search

Unit II

Optimization Methods: Hill Climbing, Genetic Algorithms, Game Trees, Minimax Algorithm, Alpha-Beta Pruning, Advanced Searching Techniques

Unit III

Ontologies, Predicate Logic, Reasoning Methods, Probability Basics, Bayesian Networks, Applications of Uncertain Reasoning

Unit IV

STRIPS Language, Forward and Backward Planning, Heuristics, Planning vs Scheduling, CSP Fundamentals, Constraint Graphs, Backtracking, Heuristics

Books and references

1. Elaine Rich, Kevin Knight (2008), Shivsankar B Nair, Artificial Intelligence, Third Edition, Tata McGraw Hill Publication
2. Russel S, Norvig P (2010), Artificial Intelligence : A Modern approach, Third Edition, Pearson Education
3. Dan W Patterson (2007), Introduction to Artificial Intelligence and Expert System, Second Edition, Pearson Education Inc.
4. Jones M(2006), Artificial Intelligence application Programming, Second Edition, Dreamtech Press Nilsson (2000), Artificial Intelligence : A new synthesis, Nils J Harcourt Asia PTE Ltd.

BRE-CS-106- Introduction to Machine Learning

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Probability Theory, Linear Algebra, Convex Optimization - (Recap), Introduction: Statistical Decision Theory - Regression, Classification, Bias Variance, Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods, Principal Component Regression, Partial Least squares

Unit II

Classification, Logistic Regression, Linear Discriminant Analysis, Perceptron, Support Vector Machines, Neural Networks - Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation

Unit III

Decision Trees, Regression Trees, Stopping Criterion & Pruning loss functions, Categorical Attributes, Multiway Splits, Missing Values, Decision Trees - Instability Evaluation Measures, Bootstrapping & Cross Validation, Class Evaluation Measures, ROC curve, MDL

Unit IV

Ensemble Methods - Bagging, Committee Machines and Stacking, Boosting, Gradient Boosting, Random Forests, Multi-class Classification, Naive Bayes, Bayesian Networks, Undirected Graphical Models, HMM, Variable Elimination, Belief Propagation, Partitional Clustering, Hierarchical Clustering, Density-based Clustering, Gaussian Mixture Models, Learning Theory, Introduction to Reinforcement Learning.

Books and references

1. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (freely available online)
2. Pattern Recognition and Machine Learning, by Christopher Bishop (optional)

BRE-CS-107- Software Reliability

Time : 3 Hours **Credit : 4**

Max Marks : 100 **Min Pass Marks : 40**

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit I

Introduction to probability concepts and software engineering, Details of reliability theory

Unit II

Classification of reliability models, Fault dependency and testing effort, Debugging process and change point issues, Software release time analysis and fault tolerant systems

Unit III

Description of Soft computing techniques, Regression and classification models, Data driven approach in software reliability, Software dependability issues

Unit IV

Introduction to MATLAB and statistical software and hands on, AI applications on reliability analysis

Books and references

1. J.D. Musa, Anthny Iannino and Kazuhira Okumoto, Software Reliabity Measurement, Prediction and Application, McGraw-Hill, 1987.
2. Kapur, P. K., Pham, H., Gupta, A., & Jha, P. C. (2011). Software reliability assessment with OR applications (Vol. 364). London: Springer.
3. Yamada, S. (2014). Software reliability modeling: fundamentals and applications (Vol. 5, p. 100). Tokyo: Springer.
4. Hoang, Pham, System Software Reliability, Springer, 2006
5. Martin L. Shooman, Software Engineering Design, Reliability and Management, McGraw-Hill, 1983.