FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS

FOR

M.Sc. (IT)
(Semester: I – IV)

SESSION: 2015-16

GURU NANAK DEV UNIVERSITY
AMRITSAR

Note:  (i) Copy rights are reserved.
    Nobody is allowed to print it in any form.
    Defaulters will be prosecuted.

    (ii) Subject to change in the syllabi at any time.
    Please visit the University website time to time.
Eligibility:

Graduate with Computer Science / IT Computer Applications / Computer Maintenance as one of the elective subjects with 50% marks in aggregate.

OR

BCA/B.Sc. (IT)/ BIT or equivalent there to with atleast 50% marks in aggregate.

OR

Graduate with mathematics as an elective subject and Post-Graduate Diploma in Computer Applications / PG Diploma in Information Tech. / PG Diploma in E-Commerce & Internet Application or equivalent with 50% marks in the aggregate

Semester – I:

<table>
<thead>
<tr>
<th>Paper</th>
<th>Subject</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT-101</td>
<td>Analysis &amp; Design of Embedded Systems</td>
<td>100</td>
</tr>
<tr>
<td>MIT-102</td>
<td>Distributed Computing</td>
<td>100</td>
</tr>
<tr>
<td>MIT-103</td>
<td>Advanced Computer Organization and Architecture</td>
<td>100</td>
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<tr>
<td>MIT-104</td>
<td>Network Operating Systems</td>
<td>100</td>
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<tr>
<td>MIT-105</td>
<td>Symbolic Logic and Logic Programming</td>
<td>100</td>
</tr>
<tr>
<td>MIT-106P</td>
<td>Programming Laboratory –I (Network Operating Systems)</td>
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</tr>
</tbody>
</table>

Total Marks: 600

Semester – II:

<table>
<thead>
<tr>
<th>Paper</th>
<th>Subject</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>MIT-201</td>
<td>Mobile Computing</td>
<td>100</td>
</tr>
<tr>
<td>MIT-202</td>
<td>Distributed Databases</td>
<td>100</td>
</tr>
<tr>
<td>MIT-203</td>
<td>Image Processing</td>
<td>100</td>
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<tr>
<td>MIT-204</td>
<td>Fuzzy Systems</td>
<td>100</td>
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<tr>
<td>MIT-205</td>
<td>Network Design and Performance Analysis</td>
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<tr>
<td>MIT-206P</td>
<td>Programming Laboratory –II (Distributed Databases)</td>
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Total Marks: 600
**Semester – III:**

<table>
<thead>
<tr>
<th>Paper</th>
<th>Subject</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>MIT-301</td>
<td>Network Protocols</td>
<td>100</td>
</tr>
<tr>
<td>MIT-302</td>
<td>Advanced Web Technologies using ASP.NET</td>
<td>100</td>
</tr>
<tr>
<td>MIT-303</td>
<td>Linux Administration</td>
<td>100</td>
</tr>
<tr>
<td>MIT-304</td>
<td>System Simulation</td>
<td>100</td>
</tr>
<tr>
<td>MIT-305</td>
<td>Microprocessor and Its Applications</td>
<td>100</td>
</tr>
<tr>
<td>MIT-306P</td>
<td>Programming Laboratory –III</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>(Based on Advanced Web Technologies using ASP.NET)</td>
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<td></td>
<td><strong>Total Marks:</strong></td>
<td><strong>600</strong></td>
</tr>
</tbody>
</table>

**Semester – IV:**

<table>
<thead>
<tr>
<th>Paper</th>
<th>Subject</th>
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<tbody>
<tr>
<td>MIT-401</td>
<td>Advanced Java Technology</td>
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</tr>
<tr>
<td>MIT-402</td>
<td>Network Security</td>
<td>100</td>
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<tr>
<td>MIT-403</td>
<td>Artificial Neural Network</td>
<td>100</td>
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<tr>
<td>MIT-404P</td>
<td>Programming Laboratory –IV</td>
<td>100</td>
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<tr>
<td></td>
<td>(Based on Advanced Java Technology)</td>
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</tr>
<tr>
<td>MIT-405P</td>
<td>Project Work</td>
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<tr>
<td></td>
<td><strong>Total Marks:</strong></td>
<td><strong>600</strong></td>
</tr>
</tbody>
</table>
M.Sc. (IT) (Semester-I)

MIT-101
Analysis and Design of Embedded Systems

Time: 3 Hrs. M. Marks : 100

Note:
(i) The paper setter is required to set eight questions in all and the candidates will be required to attempt any five questions out of these eight questions. All questions will carry equal marks.

(ii) The student can use only Non-programmable & Non-storage type calculator.

Embedded systems and their characteristics, challenges and issues in embedded software development, Hardware and electronics fundamentals for software engineers, categories of different processor, microprocessor and micro controller,

Study of embedded processors and systems like PIC, AVR, micro controller, 68000-series computer, DSP based controller.

Operating system services: different categories of operating system, kernel architecture, and root file system contents, storage device manipulations, setting up boot loader

Development tools, preliminary programming, determining the requirement, design the system architecture, system integration, commissioning the system, Hardware software co-design, and case studies in different embedded systems.

References:


M.Sc. (IT) (Semester-I)

MIT-102
Distributed Computing

Time: 3 Hrs.  M. Marks : 100

Note:
(i) The paper setter is required to set eight questions in all and the candidates will be required to attempt any five questions out of these eight questions. All questions will carry equal marks.

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Communication: Layered protocols, Client server protocols, RPC, group communication.

Coordination, synchronization & consistency: Logical clocks, Physical clocks, mutual exclusion, election algorithms, atomic broadcast, sequential consistency transaction distributed consensus, Threads: Thread synchronization, implementation issues, and threads vs. RPC.

Models of distributed computing: Client server and RPC, RPC architecture, exceptions, underlying protocols, IDL, marshalling etc.

Group models and peer to peer: Groups for service replication/ reliability, groups for parallelism / performance, client/ server vs. peer-to-peer, multicast, atomic broadcast.

Distributed file system: Security, Naming/ location transparency, R/W semantics, cache coherence, replication. Distributed shared memory: DSM architecture, consistency models and relation to caching, release consistency, comparison with message passing and RPC.

Security: Introduction, security techniques, cryptographic algorithms, authentication and access control.

Case study: CORBA, MACH

References:


M.Sc. (IT) (Semester-I)

MIT-103
Advanced Computer Organization and Architecture

Time: 3 Hrs. M. Marks : 100

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(i) The paper setter is required to set eight questions in all and the candidates will be required to attempt any five questions out of these eight questions. All questions will carry equal marks.

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Paradigms of Computing: Synchronous – Vector/Array, SIMD, Systolic

Asynchronous – MIMD, reduction Paradigm, Hardware taxonomy: Flynn’s classification, Software taxonomy: Kung’s taxonomy, SPMD.

Abstract Parallel Computational Models: Combinational circuits, Sorting Network, PRAM Models, Interconnection RAMs.

Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic Uniprocessor Architecture, Parallel Processing Mechanism.

Parallel Computer Structures: Pipeline Computers, Array Computers, Multiprocessor Systems

Architectural Classification Schemes: Multiplicity of Instruction-Data Streams, Serial versus Parallel Processing, Parallelism versus Pipelining

Pipelining: An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors, General Pipelines and Reservation Tables

Principles of Designing Pipelined Processors: Instruction Fetch and Branch Handling, Data Buffering and Busing Structures, Internal Forwarding and Register Tagging, Hazard Detection and Resolution

Superscalar and Superpipeline Design: Superscalar Pipeline Design, Superpipelined Design

Structures and Algorithms for Array Processors: SIMD Array Processors, SIMD Computer Organizations, Masking and Data Routing Mechanisms, Inter-PE Communications

References:
MIT-104: Network Operating Systems

Time: 3 Hrs.  M. Marks : 100

Note:
(i) The paper setter is required to set eight questions in all and the candidates will be required to attempt any five questions out of these eight questions. All questions will carry equal marks.
(ii) The student can use only Non-programmable & Non-storage type calculator.


Disk Management: Terminology and Concepts, Managing Disks, Managing Basic and Dynamic Disks, Disk Quotas, Disk Fragmentation, Remote Storage, RAID and Mirroring.

Servers: Managing DHCP, IIS, WINS, DNS and Proxy servers.


Telnet and FTP, Distributed Systems.

Case and Comparative Studies of Windows 2003 server and Unix/Linux.

References:
MIT-105: Symbolic Logic and Logic Programming

Time: 3 Hrs.  
M. Marks : 100

Note:
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First Order Logic: World knowledge representation and the need for quantifiers. Syntax, semantics validity consequence clause normal form.

Introduction to Prolog: Syntax of Prolog, Structured data representation. Execution model
Introduction to Programming in Prolog, Illustrative examples.

The connection between logic and logic programming: Interpreting logic programs in terms of Horn clauses Deduction from clause form formulas resolution for prepositional logic Ground resolution. Unification and first order resolution SLD resolution; the computation and search rules. SLD trees and interpretation of non-declarative features of Prolog.


References:
M.Sc. (IT) (Semester-I)

MIT-106 P
Programming Laboratory – I

Time: 3 Hrs. M. Marks : 100

Programming laboratory based on Network Operating System
Introduction:

Modern Wireless Communication Systems
2G/2.5G/3G/4G Wireless Networks and Standards, Wireless in Local loop & LMDS

Cellular Concepts
Frequency spectrum, frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, fundamentals of antennas, Equivalent circuit for antenna, Antennas as cell site, Mobile antennas, Analog Vs Digital, Spectrum regulation, Licensing methods.

Cellular Networks
Mobile Radio Propagation, A basic cellular system, Performance criterion, Operations of Cellular Networks, Concept of frequency reuse Channels, Co channel Interference and it's reduction factor, types of non co channel Interference, Desired C/I from normal case on omni directional antenna systems, Digital Modulation

Multi Access Technique & Wireless Standards
TDD, FDD, Rake receiver, CDD, Spread spectrum, (direct and frequency hopping) FDMA, TDMA, CDMA, Wireless Standards GSM, CDMA, DECT, UMTS & IMT-2000,

WAP Model and architecture, Gateway, Protocol stack, Wireless Application environment

Wireless LAN
IEEE 802.11 Concepts, MAC Layer, Spread Spectrum Wireless LAN, Infrared Wireless LANs, Other Physical Layer Protocol (IEEE 802.11b, IEEE 802.11a), Wireless PAN (Bluetooth), HIPERLAN, Mobile Network Layer (Mobile IP), Mobile Transport Layer (Mobile TCP), Mobile Data network (GPRS),

GSM Systems Overview
Architecture, Location tracking, and call setup. Security, Data Services N/W Signaling, GSM mobility management, Operations, Administration and maintenance. GSM bearer Services. SMS architecture-Protocol Hierarchy, DTE-DCE interface, Mobile prepaid phone services.

References:
   Wireless communication, T. S. Rappaport, PHI, 2005
   Mobile Communications, J. Schiller, Pearson Education, 2006
Introduction
Concepts, Advantages and Disadvantages of Distributed Database Management System (DDBMS), Homogenous and Heterogeneous DDBMS. Functions of a DDBMS.

Distributed Database Management System Architecture

Distributed Relational Database Design
Fragmentation: Reasons, Alternatives, Degree, Information requirement. Horizontal, Vertical, Hybrid Fragmentation.

Allocation: Allocation Problem, Information Requirements for allocation.

Distributed Relational Database Query Processing & Optimization
Query Decomposition, Localization of Distributed Data, Query Optimization, Introduction to Distributed Query Optimization Algorithms

Distributed Concurrency Control, Objectives, Distributed Serializability, Centralized two-phase locking, Distributed two-phase locking.

References:
MIT-203: Image Processing

Time: 3 Hrs.  

M. Marks : 100

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(ii) The student can use only Non-programmable & Non-storage type calculator.

Image Restoration: - Degradation models for continuous function, effect of diagonalization, on-degradation, algebraic approach to restoration, interactive restoration, Gray level interpolation.
Image Encoding and Segmentation: - Encoding, Mapping, Quantizer and Coder.
Segmentation: - Detection of discontinuation by point detection, line detection, edge detection.
Edge linking and boundary detection:- Local analysis, global by graph, theoretic techniques.
Thresholding:- definition, global thresholding.
Filtering:- median, gradient, simple method of representation signatures, boundary segments, skeleton of region.


Noncausal representation, Linear prediction in two-dimensions, two-dimensional spectral factorization & estimation, Image decomposition, Fast KL transforms, Stochastic decoupling.

Image observation models, Inverse & Weiner fitting, FIR Weiner fitters, Fitting using Image transforms, Least square fitters, Generalized inverse, SVD & iterative methods.

Spatial feature Extraction, Transform feature, Edge detection, Boundary extraction, Boundary Representation, Region representation, Moment representation.

Structures Shape features, Texture, Scene matching & detection, Image Segmentation, Classification techniques, Image understanding.

References:

Introduction to fuzzy logic and fuzzy sets.

Fuzzy relations, fuzzy graphs, fuzzy arithmetic, fuzzy if-then rules.

Fuzzy implications and approximate reasoning, fuzzy logic and probability theory.

Fuzzy model identification, use of fuzzy logic in database and information systems.

Use of fuzzy logic in the area of artificial intelligence and Pattern recognition.

Neuro-fuzzy systems, genetic algorithm and fuzzy logic.

**References**


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Requirements, planning, & choosing technology: Business requirements, technical requirement user requirements, traffic sizing characteristics time & delay consideration.

Traffic engineering and capacity planning: Throughput calculation traffic characteristics & source models, traditional traffic engineering, queued data & packet switched traffic modeling, designing for peaks, delay or latency

Network performance modeling- creating traffic matrix, design tools, components of design tools, types of design projects.

Technology Comparisons- Generic packet switching networks characteristics, private vs. public networking, Business aspects of packet, frame and cell switching services, High speed LAN protocols comparison, Application performance needs, Throughput, burstiness, response time and delay tolerance, selecting service provider, vendor, service levels etc.

Access Network Design- N/W design layers, Access N/W design, access n/w capacity, Backbone n/w design, Backbone segments, backbone capacity, topologies, Tuning the network, securing the network,

Design for network security.

Network Optimization: Network optimization theory: Goals of network optimization, measurements for network optimization, optimization tools, optimization techniques.

Reference:
Programming Laboratory based on Distributed Databases
MIT-301: Network Protocols

Time: 3 Hrs.  M. Marks : 100

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Internet Addresses, Mapping internet addresses to Physical addresses (ARP) & Determining an internet addresses at Startup (RARP) : Universal identifiers, three Primary classes of IP addresses, network and Broadcast Addresses, Limited Broadcast, Dotted decimal Notation, weakness in Internet addressing, Loopback addresses. Address resolution problem, two types of Physical addresses, resolution through Direct Mapping, Resolution Through Dynamic Binding, address Resolution Cache , ARP to other Protocols. Reverse address resolution protocol, timing RARP transaction, Primary and backup RARP sever.


Internet Protocol : Error and Control Message(ICMP) & Subnet and Supernet Address Extension: The internet control message protocols, Error reporting versus error detection. ICMP message format. Detecting and reporting various network problems through ICMP. Transparent Router, Proxy ARP, subset addressing, implementation of subnets with masks representation, Routing in the presence of subsets, a unified algorithm.


Reliable Stream Transport service (TCP) : The Transmission control Protocol, pots, Connections and Endpoint , passive and active opens the TCP segment format . TCP implementation issues.

References:
2. Forouzan, TCP-IP, Protocol Suit, TMH.
5. SNMP, Stallings, Pearson.
6. TCP-IP Network Administration, Hunt Craig.
MIT-302: Advanced Web Technologies using ASP.NET

Time: 3 Hrs.                                    M. Marks : 100

Note:
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(ii) The student can use only Non-programmable & Non-storage type calculator.

Standard Controls : Display information, Accepting user input, Submitting form data, Displaying images, Using the panel control, Using the hyperlink control.

Validation Controls : Using the required field validator control, Using the range validator control using the compare validator control, Using the regular expression validator control, Using the custom validator control, Using the validation summary controls.

Rich Controls : Accepting file uploads, Displaying a calendar, Displaying advertisement, Displaying different page views, Displaying a wizard.

Designing Website With Master Pages : Creating master pages, Modifying master page content, Loading master page dynamically.

SQL Data Source Control: Creating database connections, Executing database commands, Using ASP.NET parameters with the SQL data source controls, Programmatically executing SQL data source commands, Cashing database data with the SQL data Source controls.

List Controls : Dropdown list control, Radio button list controls, list box controls, bulleted list controls, custom list controls.

Grid View Controls : Grid view control fundamentals, Using field with the grid view control, Working with grid view control events extending the grid view control.

Building Data Access Components With ADO.NET : Connected the data access, Disconnected data access, Executing a synchronous database commands, Building data base objects with the .NET framework.


Caching Application Pages And Data : page output caching, partial page caching, data source caching, data caching, SQL cache dependences.

Reference :
ASP.NET 3.5: Stephen Walther, Pearson Education, 2005
M.Sc. (IT) (Semester-III)

MIT-303: Linux Administration

Time: 3 Hrs.  M. Marks : 100

Note:
(i) The paper setter is required to set eight questions in all and the candidates will be required to attempt any five questions out of these eight questions. All questions will carry equal marks.

(ii) The student can use only Non-programmable & Non-storage type calculator.

**Introduction** : Introduction to LINUX, Installing LINUX, Partitions, LILO, Installing software packages. Updating with Gnome, Updating with KDE, Command line installing.


**Administering Linux** : Creating a user A/C, modifying a user A/C, Deleting a user A/C, Checking Disk Quotas, System Initialization, System start-up & shutdown, Installing & managing H/W devices.

**Setting Up A LAN** : Understanding LAN, Setting up Wireless LAN, Understanding IP address, Troubleshooting LAN.

**Setting Up Print Server** : Choosing CUPS, Working with CUPS Pointing, Managing Pointing, Configuring Point Server.

**Setting Up File Server** : Setting up an NFS, SAMBA, Installing & Running send mail.

**Setting Up Web Server** : Configuring the Apache Server, Starting & stopping the server, Monitoring Server Activities.

**Setting Up DHCP & NIS** : Setting up DHCP Server, Setting up DHCP Client, Setting up Network Information Service.

**Troubleshooting** : Troubleshooting LINUX in GRUB mode.

**References** :
1. Redhat Linux(10) Bible : Christopher Negus, 2003
2. Linux Unleashed : Tim Parker, 2006
MIT-304: System Simulation

Time: 3 Hrs. M. Marks : 100

Note:
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(ii) The student can use only Non-programmable & Non-storage type calculator.

Introduction : Concept of a system, stochastic activities, continue and discrete system, system modeling, mathematical modeling, principle used in modeling.

Simulation of Systems : Concepts of simulation of continuous systems with the help of two examples; use of integration formulas; concepts of discrete system simulation with the help of two examples, Generation of random numbers, Generation of non-uniformly distributed numbers.


Simulation in Inventory Control and Forecasting : Elements of inventory theory, inventory models, Generation of Poisson and Erlang variats, forecasting and regression analysis.

Design and Evaluation of Simulation Experiments : Experimental layout and validation.

Simulation Languages : Continuous and discrete simulation languages, Block-Structured continuous simulation languages, expression based languages, discrete system simulation languages, simscript, GPSS, SIMULA, Simpack, GASP IV, CSIM, factors in selection of a discrete system simulation languages.

Case Studies : Analytic Vs Simulation Models, Applications to Operating Systems, Databases, Computer Networks Architectures.

References :
MIT-305: Microprocessor and its Applications

Time: 3 Hrs.  
M. Marks : 100

Note:
(i) The paper setter is required to set eight questions in all and the candidates will be required to attempt any five questions out of these eight questions. All questions will carry equal marks.
(ii) The student can use only Non-programmable & Non-storage type calculator.

Introduction : Introduction to Microprocessor, General Architecture of Microcomputer System. Microprocessor Units, Input unit, Output unit, Memory unit and auxiliary storage unit.

Architecture of 8086/8088 Microprocessor : Description of various pins, configuring the 8086/8088 microprocessor for minimum and maximum mode systems, Internal architecture of the 8086/8088 microprocessor, system clock, Bus cycle, Instruction execution sequence.

Memory Interface of 8086/8088 Microprocessor : Address space and data organization, generating memory addresses hardware organization of memory address space, memory bus status code, memory control signals, read/write bus cycles, program and data storage memory, dynamic RAM system.

Input/Output Interface of the 8086/8088 Microprocessor : I/O interface, I/O address space and data transfer, I/O instructions, I/O bus cycles, Output ports, 8255A Programmable Peripheral Interface (PPI), Serial communication interface (USART and UART) – the RS-232 C interface.

Interrupt Interface of 8086/8088 Microprocessor, Types of Interrupt, Interrupt Vector Table (IVT).

References:
Peter Abel : IBM PC Assembly Language and Programming, PHI, Delhi.
MIT-306P: Programming Laboratory-III  
(Based on Advanced Web Technologies using ASP.NET)

Time: 3 Hrs.  
M. Marks: 100

Programming Laboratory based on Advanced Web Technologies using ASP.NET and LINUX.
Note:
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(ii) The student can use only Non-programmable & Non-storage type calculator.

Java I/O: I/O Basics, Streams, reading Console input and writing console output, Print Writer Class, Reading & Writing Files, Byte Streams, Character Streams & Serialization.

Multithreaded Programming: The Java Thread Model, Thread Priorities, Synchronization, Interthread communication, Suspending Resuming and Stopping Threads.


Event Handling: The Delegation Event Model, Event Classes, Event Listener Interfaces


Servlets: Life Cycle of a Servlet, The Servlet API, Reading Servlet Parameters, Handling HTTP Requests and Responses, Cookies & Session Tracking.

References:
MIT-402: Network Security

Time: 3 Hrs. M. Marks: 100

Note:
(i) The paper setter is required to set eight questions in all and the candidates will be required to attempt any five questions out of these eight questions. All questions will carry equal marks.
(ii) The student can use only Non-programmable & Non-storage type calculator.


Stateful Firewalls: How a Stateful Firewall works, The concept of state, Stateful Filtering and stateful Inspection.

Proxy Firewalls: Fundamentals of Proxying, Pros And Cons of Proxy Firewalls, Types of Proxies, Tools of Proxying.

Security Policy: Firewalls Are Policy, How to develop Policy, Perimeter Consideration.


The Need for Host Hardening: Removing or Disabling of Unnecessary Programs, Limiting access to data And Configuration Files, Controlling User and Privileges, Maintaining Host Security Logs, Applying Patches, additional Hardening Guidelines.

Host Defenses: Hosts and the perimeter, Antivirus Software, Host-Based Firewalls, Host-based Instruction detection, Challenges Of host defenses components.


Separation Resources: Security Zones, Common Design Elements, VLAN-Based Separation.
Time: 3 Hrs.                                     M. Marks: 100

Note:
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Neural Network Learning: Basic learning rules, supervised by unsupervised learning, Method of steepest Descent, LMS Algorithm.


References:
Programming Laboratory based on Advanced Java Technology.
The Project is to be prepared based on current problems from industry / business / academic domain using some currently available technology / platform.

**Note:**

1. The end semester project work evaluation is to be conducted by following panel of examiners:
   a. Internal Examiner
   b. External Examiner (to be appointed by GND University, Amritsar)
   c. Head/Head’s nominee (where Head means Head, DCSE, GND University, Amritsar.)
2. The Project are to be submitted as per the common ordinances for P.G. courses under semester system.