Subject: - Conduct of Screening Test and notification of the Syllabus for the posts of Lecturer-I Computer Engineering in Technical Education Department.

NOTIFICATION NO. 27–PSC (DR-SYL) of 2012
D A T E D - 25-4-2012

In continuation of Notification No.17-PSC of 2012 dated 20.03.2012, the Syllabus for conduct of Screening Test for the posts of Lecturer –I Computer Engineering in Technical Education Department is notified as under:-

1. Electronic Devices and Circuits

(i) **Introduction to Semiconductors**: Intrinsic and extrinsic semiconductors transport mechanism of charge carriers, electric properties, Hall effect etc. Electronic Devices, their characteristics and applications, p-n junction diode. Current components in p-n junction, characteristics-piece wise linear approximation, temperature dependence, Diode capacitance, and switching times, diode circuits half wave, full wave rectifiers, clipping circuits etc. Basic operations of Zener, avalanche, schottky photo and tunnel diodes

(ii) **BJT's**: Types operation and characteristics, Ebers-Moll model, CE, CB and CC configuration input, output characteristics and graphical analysis of basic amplifier circuits, Biasing and Bias stability, Low frequency, h-parameter model, Analysis and Design of transistor amplifier circuits using h parameters. High frequency hybrid – pi model, analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, phototransistors, Transistor as a switch, SCR's and Thyistors.

(iii) **FET's**: Operation and characteristics, model Application at low and high frequency, amplifiers, switching circuits, MOSFEET TYPES, Operation and characteristics. Cathode Ray Cathode Ray Oscilloscope Basic operation and measurement applications.

(iv) **Hybrid II Model**: Gain band width product, Emitter follower at High Frequency Response of CE Amplifiers, Miller effect, Common Drain Amplifier at high frequencies.

2. Digital Electronics and Logic Design

(I) **Digital Systems and Binary Numbers**: Binary numbers, Number –Base Conversions , Arithmetic operations using number system, Data Representation - fixed and floating, Complements(1's and 2's),Binary codes – weighted / non-weighted codes, BCD codes, Excess- 3-code, Grey codes, Conversion between codes, Code convertors Codes for error detection and correction (Hamming code).

(II) **Boolean Algebra and Logic Simplification**: Boolean Algebra, Logical gates, Simplification of Boolean function using Boolean algebra ,Karnaugh map(up to five variables), Quine Mcclusky Methods, Logic Family & their characteristics (RTL, DTL, TTL, ECL, MOS & CMOS ).

**Combinational Logic design** -Half and Full adders, Half and full subtractors, BCD Adder , Comparators.

(III) **Decoders, Encoders , Multiplexers, De-Multiplexers, Programmed logic devices –Read only memory, Programmable Read only Memories (PROM) and Programmable Logic Arrays (PLA), Programmable
Array Logic (PAL), Analog to digital converter (ADC), Digital to Analog converter (DAC).

(IV)  **Sequential logic design:** Latches and Flip flops, conversion between flip flops, Shift Registers, Analysis of synchronous and asynchronous counters, Design of Synchronous and Asynchronous Sequential circuits, State Reduction and Assignment, ASM Charts.

(V)  **VHDL Programming:** Introduction, Code Structure, Data Types Operators & Attributes, Concurrent Code, Sequential Code, Signals & Variables, State Machines, Circuit Designs.

3.  **Numerical Methods**

(i)  **Numbers representation & Errors:** - Computer representation of numbers, accuracy of numbers, Errors, Sources of Errors and their propagation, Error Analysis & the idea of conditioning Errors in approximation.

(ii)  **Roots of algebraic equations:** - Bisection methods, Secant methods, Newton Raphson Method, Integrated synthetic division with quadratic factors, method for finding complex roots, Graeffe’s Root squaring method.

(iii)  **Solution of simultaneous algebraic equations:** - Gauss Elimination, Gauss Jordan, Partition method for linear system of equations, Power method for finding Eigen values, properties & bounds for Eigen values & Eigen vectors.

(iv)  **Interpolation:** - Newton’s Forward, Backward & Divided difference interpolation, Central difference interpolation formula, Stirling’s & Bessel’s formula, Langrange’s interpolation formula.

(v)  **Numerical Differentiation & Integration:** - Derivatives using Forward Difference Formula, Backward difference formula & Central difference formula, Numerical Integration using Trapezoidal Rule & Simpson’s Rule.

(vi)  **Difference equations & their solutions:** - Taylor’s series method, Euler’s method, Ranga kutta method, Predictor – Corrector method, Adams –Bashforth method.

4.  **Microprocessor**

(i)  **Microcomputer Structure and Operations:** Basic Microcomputer Elements, Typical Microcomputer Structure, CPU, Memory System, Input Output.

(ii)  **Microprocessors and Memory:** Typical 8, 16 and 32 bit Microprocessors, 8085 Microprocessor Specification, Memory Technologies.

(iii)  **Assembly Language Programming:** Programming Model of 8085, Registers, Fetch, Execute Operation of CPU, Instruction SetAddressing Modes, Basic Operations, Microprocessor Arithmetic, Program Flow, Control Using Looping and Branching. Stack, Subroutines, Interrupts, Resets.

(iv)  **Bus System:** System Bus Structure, Bus Operations, Cycle by Cycle Operations, Timing and Control, Priority Management, Address Decoding.

(v)  **Microprocessors Interfacing:** Interfacing concepts, Parallel Input Output, Memory Interfacing, Direct Memory Access. The Serial Subsystems. Programmable Peripheral Interface, Analog Converter Subsystem.


5.  **Communication Systems & Engineering**

(i)  **Special analysis of Signals:** Fourier series of repetitive signals, Fourier transform of non-repetitive signals, Amplitude spectrum of special signals viz., pulse train and pulse waveform.
6. **Theory of Computation and Formal Languages**

(i) **Basic concepts of theory of computation**: Alphabets, Strings, and Representations, Formal Languages and Grammars, Finite Stage Transducers, Finite-State Automata and Regular Languages, Limitations of Finite-Memory Programs, Closure Properties for Finite-Memory Programs, Decidable Properties for Finite-Memory Programs.

(ii) Recursive finite-domain programs, Recursion, Pushdown Transducers, Context-Free Languages, Limitations of Recursive Finite-domain Programs, Closure Properties for Recursive Finite-Domain Programs.

(iii) Turing Machines. Programs and Turing Transducers, Non-Determinism versus Determinism, Universal Turing Transducers, Un-decidability. Decidable Properties for Recursive Finite-Domain Programs.

(iv) Introduction to resource-bounded computation, Time and Space, A Time Hierarchy, Nondeterministic Polynomial Time, More NP-Complete Problems, Polynomial Space, P-Complete Problems.

(v) **Complexity theory**: time complexity, space complexity, intractability.

7. **Data Structures**

(i) **Introduction**: Introduction to Data Structure; Primitive and non-primitive data structure; Linear and non-linear data structure; Recursion Function and its examples. String Manipulation, String Matching Techniques & Applications; Markov theorem and its applications; Sparse array and its implementation.

(ii) Concept of Stack and Queue. Single and Doubly-Linked Lists. Circular linked List, their implementation and comparison. Array based and Linked List based implementation of stack and queues and their applications.

(iii) **Searching**: Sequential and Binary Search on Array – based ordered lists and their time complexity; Concept of Hash Functions, Hash-tables and Hashing with Chaining. **Sorting Techniques**: Insertion Sort, Selection Sort, Quick Sort, Heap Sort. External Sorting: K-way Merge Strategy. **File Structure**: Sequential Files, Indexed Files, Direct Files.


8. **Computer Organization and Architecture**

(i) **Introduction**: Basic structure of Computers, stored programme concept, Basic Operational concepts, Functional Units, Machine language, concept of memory locations, addresses, addressing modes, instruction format, comparison between mainframe, mini Computer, microcomputer.
(ii) **Processing and execution**: Processing unit, execution of instructions, control step sequence, different types of instruction, ALU Design, Arithmetic Processes, Control Unit Design, Hardwired & Micro programmed Control Unit.

(iii) **Input output organisation**: I/O Systems – Programmed Control, Interrupt controlled & DMA Data transfer Schemes, I/O Processors.

(iv) **Memory Management**: Memory organisation, Characteristics of memory size, Access time, Read/write cycle time, Sequential and Random access semiconductor memories, Virtual memory, Cache memory, Memory Hierarchy, Secondary storage devices- Magnetic Disks, Magnetic Tapes, CD ROM’s.

(v) **Parallel processing**: Basic Concepts, Types of parallel Processors, Pipelined processors, Pipelined Structures.

9. **Object Oriented Programming**

(i) **Introduction**: Basic features & concepts of Object Oriented Programming (OOP), Benefits, Languages and Applications of OOPs.

(ii) **Tokens, Expressions and Control Structures**: Tokens, Keywords, Identifiers & Constants, Basic Data types, User-defined Data types, Derived Data Types, Memory Management Operators, Manipulators, Expressions, Operator Overloading, Control Structures

(iii) **Functions in C++**: Main function, function prototyping, call by reference, inline functions, default functions, function overloading

(iv) **Classes and Objects**: Specifying a class, defining member functions, private member functions, array within a class, memory allocation for objects, arrays of objects, objects as function arguments, returning objects, pointers to members, local classes

(v) **Constructors & Destructors**: Constructors, Parameterized Constructors, Constructors with Default arguments, Dynamic Initialization of objects, Dynamic Constructors & Destructors

(vi) **Operator Overloading & Type Conversion**: Definition & Rules of overloading Operators, Overloading Binary & Unary Operators

(vii) **Inheritance**: Definition, single, multilevel, multiple, hierarchical and hybrid inheritance, virtual base classes, abstract classes

(viii) **Pointers, Virtual Functions and Polymorphism**: Pointers, Pointers to Objects and derived classes, virtual functions, Pure virtual functions

(ix) **Templates**: Class templates, function templates, overloading of function templates, member function templates

(x) **Strings**: Creating and manipulating string objects, accessing characters in strings, comparing and swapping

10. **Operating Systems**

(i) **Introduction**: Operating system and function, Evolution of operating system, Batch, Interactive, Time Sharing and Real Time System, System protection.

(ii) **Operating System Structure**: System Components, System structure, Operating System Services.


(iv) **CPU Scheduling**: Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling.

(v) **Deadlock**: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock combined approach.
(vi) **Memory Management**: Base machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Organization, Impact on performance.

(vii) **I/O Management & Disk Scheduling**: I/O devices and organization of I/O function, I/O Buffering, DISK I/O, Operating System Design Issues.


11. **Compiler Design**


(II) **Lexical Analysis**: Interface with input, parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, Error Reporting, Regular definition, Transition diagrams, LEX. Capabilities of Lexical Analyzer

(III) **Finite Automata**: Nondeterministic Finite Automata, Deterministic Finite Automata, Subset Construction, Thompson’s Construction, DFA State Minimization. The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.

(IV) **Basic Parsing Techniques**: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Nonrecursive Predictive Parsers, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers. YACC, Syntax Directed Definitions, Type checking.

(V) **Run Time Memory Management**: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table Management.

(VI) **Error Detection and Recovery**: Lexical phase errors, Syntactic phase errors, Semantic errors.

(VII) **Intermediate Code Generation**: Different Intermediate forms: three address code, Quadruples & Triples.

(VIII) Sources of optimization, Local Optimization, Loop optimization, Peephole optimization, Issues in the design of Code Generator, Basic Blocks and Flow Graphs, Transformations on Basic Blocks, DAG, Code Generation Algorithm, Register Allocation and Assignment.

12. **Computer Networks**

(i) **Data Communication Systems**: Introduction to communication system, synchronous and asynchronous systems, serial and parallel system, Modems, RS 232 interface, uses of computer networks, Network topologies, OSI Reference Model, TCP-IP Reference Model.

(ii) **Computer Networks**: X.25 Networks, Physical layer: Transmission media, ISDN services, ATM networks, Cellular Radio, SONNET

(iii) **Data Link Layer**: Design Issues, Protocols (Sliding window protocols) HDLC.

(iv) **Medium Access Sub layer**: Static Channel v/s Dynamic Channel, Aloha, Multiple access protocols, IEEE 802.3, 802.4, 802.5, Bridges, FDDI.

(v) **Network Layer**: Routing Algorithms, Congestion Control, Internetworking.

(vi) **Transport Layer**: Transport services, Elements of Transport protocols.

(vii) **Session Layer & Presentation Layer**: Design Issues

(viii) **Application Layer**: Presentation and Network security, Data Compression, DNS, ASN-1, email, Usenet, Introduction to WWW, DES, Ciphers, Authentication, Firewalls.

(ix) **Network security**: Need for network data security, plaintext, ciferxtex, encryption techniques, substitution, transposition, DES encryption standard, Private key, public key, Authentication.
Internetworking and Internet fundamentals: Network Interconnections, Bridges, Routers, Internet Concepts, Brief concepts about common Channel signaling and Integrated Digital Networking.

13. Artificial Intelligence


(ii) Reasoning in logic: Brief revision of propositional and predicate logic. Different characterizations of reasoning, Generalized modus ponens Resolution, Prolog, Forward and backward chaining.

(iii) Knowledge Representation: Diversity of knowledge, Inheritance hierarchies, Semantic Networks, Knowledgeable ontologies

Handling uncertainty: Diversity of uncertainty, Probability theory in intelligent systems, Dempster-Shafer theory.


(iv) Intelligent agents: An architecture for intelligent agents Multi-agent systems

Nature and Goals of Neural Computing: Comparison with rule-based AI Overview of network architectures and learning paradigms

Binary Decision Neurons: The McCullough – Pitts Model, Single-layer perceptrons and their limitations

(v) The Multilayer Perception: The sigmoid output function, Hidden units and feature detectors, Training by error back propagation, The error surface and local minima, Generalization, how to avoid ‘overtraining’

The Hopfield Model: Content Addressable memories and attractor nets Hopfield energy function, Setting the weights, Storage capacity Topographic maps in the brain Self-Organising Nets: The Kohonen self – organizing feature map.


(i) Introduction: Co-ordinate representation, Pixel, Raster Scan & Random Scan methods, color CRT Raster scan basics, video basics, interactive devices, graphics input and output devices, mouse, trackball, light pen, digitizer, thumb wheel, raster scan graphics.


(iv) Geometric Transformations: - 2-D and 3-D Transformation: Translation, Scaling, Rotation, Matrix Arithmetic and Matrix Composition.


(vii) Role of Virtual Reality in Graphical Simulation.

15. Software Engineering


(ii) System and software Planning: Planning phase of system definition, system analysis, Modeling the system architecture, system specification, Software planning objectives, Software scope,
project estimation, Decomposition techniques, Empirical estimation models ,Automated estimation models, Software project scheduling, Software acquisition, Software re-engineering.

(iii) **Software requirement analysis**: Requirement analysis, Analysis principles, specifications requirement analysis tools, Data flow diagrams.

(iv) **Software Design Fundamentals**: The design process, Design fundamentals, Effective modular design, Data design, Architectural design, procedural design, Design documentation.

(v) **Data flow oriented design**: Design and information flow, design process considerations, transform analysis, transaction analysis, Design post processing.


(vii) **Software Quality Assurance**: Software quality and software quality assurance, Software reviews, software quality metrics, software reliability, complexity measures, storage and processing time analysis.


(ix) **Software maintenance**: Definition, Maintenance characteristics, Maintainability, Maintenance Tasks, Maintenance Side Effects, Reverse Engineering and Re-engineering.


16. **Database Management Systems**

(i) **Basic Concept**: Elementary Database concepts, Data Modeling-Records and files-Abstraction and data integration- Views-Data independence-Components of DBMS-Advantages and disadvantages.

(ii) **Data Models**: Data associations, Data models classification, Entity - relationship model, Relational, Network and Hierarchical models, Comparison of these models.

(iii) **File Organization**: Introduction, Serial Files, Sequential files, Index Sequential files, Direct Files, Indexing using tree structure, Logical and physical pointers, Record placement.


(v) **Distributed Databases**: Introduction, Advantages and disadvantages of DBMS, Networks Data distribution, Object naming, distributed query processing.

17. **Internet & Web Design**

(i) **Computer Networks**: Basics of Networks, Topologies of Networks, Layers in Networking, Layers in Networking, Switching in the Networks, Bridges, Routers and Gateways, Types of Networks

(ii) **The Internet**: Basics of Internet, Addresses and Names for the Internet, Web Objects, and Sites, E-Mail, World Wide Web, File Transfer, The ‘Telnet’, The ‘Usenet’,


(v) **Searching and Web-Casting Techniques:** How to Get Found or Hidden Data from Search Engines, Subscribing, Introduction, Search Engines, Search Tools.

(vi) **Java Programming:** Why Java? Java Programming Language, Java Classes, Constructors, Java Object and their Creation, Inheriting Members from Another Class, Interfacing Methods from Other One or More Classes, Abstract Class (or Super Class) for One or More Subclasses, Data Encapsulation, Inner Classes within a Class, Multiple Threads,

(vii) **Java IO:** Java IO input Streams and Output Streams for Bytes, Java IO Character Stream Related Reader and Writer Classes, Java IO File Related Classes

(viii) **Java Components:** Human Computer Interface and Windows Environment, Creating a GUI, Applets, Various Ways of Event Handing in Components and Applets, Javabean, CORBA and EJBs.


(x) **The Dynamic Functionality in Web Pages:** CGI, Four Steps for a CGI Script Communication, CGI Script Languages, A Scripting Language—‘JavaScript’, Dynamic Page Functionality Using Servlets and JSPs, Dynamic Page Functionality Using ASPs, COMs, DCOMs and ASP.

**Questions relating to General Knowledge**

Questions on General Knowledge, shall comprise National Affairs, J&K Affairs and questions relating to the subject.

It is further notified that break-up of the questions shall be as under:

i) Total questions - 120
ii) Pertaining to subject syllabus - 100
iii) Pertaining to General Knowledge - 20

The questions shall be of multiple objective types, to be attempted in two hours.

*Note:* The date for Screening Test shall be notified separately which would tentatively be conducted in the first week of July at Jammu and Srinagar in accordance with Rule 40 of J&K Public Service Commission (Business and Procedure) Rules, 1980 as amended from time.

Sd/-
(M. A. Bukhari), IAS
Secretary
J&K Public Service Commission

No.PSC/DR/Lecturer-I Comp. Engg/2012

Dated: -25-04-2012

Copy to: -

1. Commissioner Secretary/Secretary to Government, Technical Education department, Civil Secretariat, Jammu.
2. Director, Information Department, J&K Govt., for publication of this Notification in two leading local dailies of Srinagar/ Jammu.
3. The General Manager, Govt. Press, Jammu for publication of this Notification in the Government Gazette.
4. Additional Secretary (G)/(I), J&K Public Service Commission.
5. Deputy Secretary (O), J&K Public Service Commission.
6. Prt. Pvt. Secy to Hon’ble Chairman for information of Hon’ble Chairman.
7. Pvt. Secretary to Member, PSCPSh. ____________ for information of the Hon’ble Member.
8. Under Secretary (I), J&K Public Service Commission.
9. P.A to Chairman for information of the Hon’ble Chairman.
10. P.A. to Secretary, PSC for information of the Secretary
11. I/C Computerization, J&K PSC for uploading the Notice.
12. I/C Camp Office, Srinagar for displaying the Select List in Srinagar Office.