HIGHER SECONDARY SCHOOL TEACHER (JUNIOR)
(COMPUTER SCIENCE)
KERALA HIGHER SECONDARY EDUCATION
(CATEGORY No.341/2017)

PART - I

Module I   Digital Systems, Microprocessors & Computer Organization

- Number System (binary, hexa, octal, complements) codes (ASCII, UNICODE, BCD, GRAY), Error detecting and correcting code-parity and Hamming codes. Boolean algebra & Laws.
- Combinational circuits – SOP & POS form, K-Map – encoders, Decoders, multiplexers, demultiplexers-sequential circuits-flipflops, registers & counters.
- Integer representation (signed & unsigned). Half and full address, sequential multiplier, Booth algorithm– floating point representation (IEEF).
- Basic operational concepts – functional units.
- Processor-8085-Architecture-instruction set, fetch & execute, addressing mode, interrupts.
- 8086 -Architecture-registers, RAM organization segment-offset addressing, real & protected modes, addressing modes, instructions – arithmetic, data movement, control, I/O string, logical. Subroutine call & return.
- Features of pentium processor.
- Control unit organisation - Single bus and multibus organisation, Micro instruction, Microprogrammed and hardwired control, Microinstruction-program-sequencing, RISC &CISC (Features)
- Memory – Hierarchi, organisation of RAM, types of RAM (SRAM, DRAM, SDRAM, DDRAM). Cache-operation, cashe mapping, multilevel organization of cache (LI/LII, Primary/secondary). Virtual memory page fault, TLB, segmentation – Multiple memory modules & interleaning.
- Secondary storage – Disk-CDROM/DVD.
- I/O devices (keyboard, mouse, CRT/LCD/LED, Printers, scanners). I/O Interfacing – memory mapped & I/O Mapped I/O, Polling, interrupt driven I/O, DMA – controller. Serial communication – UART, RS 232, USB.
- High performance computing – pipelining, basic conceps in parallel processing, Grid and cluster computing.

Module II

Data Structures of Algorithms

Data Structures – abstract data types – time and space complexity (O, Ω, θ) – practical complexities. Recursive algorithms. Randomized algorithms.

Arrays – representation-address calculation, sparse matrix representation, polynominal and sparse polynominal representation.

Linkied list – single, doubly, circular lists. Header and trailer nodes, basic operations on

linked lists (insertion, deletion, merging, concentration, search), linked polynominal, sparse matrix representation using linked list.

Stock-array and linked implementation. Application- evaluation and conversion of expressions.

Queue – array and linked implementation – circular array queue, priority queue.

Non-linear data structures – tree-basic definition, binary tree- array and linked representation, tree traversal (recursive and nonrecursive) threaded binary tree, binary search tree, AVL trees, B-trees, Red-black trees, decision and game trees.

Searching – binacy & sequential, sort, bubble, heap, insertion & selection.

Representation of graphs – BFS & DFS algorithm Minimum cost - _____ free.

Divide & conquer – general method, quick sort, merge sort.

Greedy method – general method, knapscale problem, tree vertex splitting.

Dynamic programming: General method, multistage graph, all pairs shortest path.

Back tracking: General method, sub of subsets, 8-queries problem.

Basic concepts of NP hard and NP - problem.

Module III

Operating Systems

System software – definition, components, operating system, language translator, loaders, linkers, interpreters, compilers, overview of compilation process, scanning, pausing, code optimization, software tools, library routines, text editors, program generators, debugging tools.

OS as a resource manager, structrue of OS shell, Kernel, utilities, resourse management routines, evlution of OS, multiprogramming, time sharing, real time systems, parallel systems, distributed systems, OS functions process disription and control, process control, process state, operation on process, concurrent process, threads, processes and threads, micro kernels, schedulers, scheduling algorithms, independent and concurrent processes, critical section, mutual exclution, Petersons solution, semaphore, classical synchronization concept of interprocess communications. Deadlock, starvation, conditions for deadlock, resource allocation problem, deadlock handling, prevention and avoidance, Bankers algorithm deadlock detection and recovery.

Concept of memory, address binding, logical address, physical address, swapping, contiguous allocation fixed partition variable partition fragmentation. Noncontiguous allocation, paging segmentation, virtual memory-demander paging. replacement algorithms, thrashing protection and security mechanisms, accidental data loss, protection mechanisms, user authentication, attack from inside, viruses, antiviruses.

I/O managments, I/O hardware, application I/O interface kenrnel I/O subsystem DISK I/O, disk scheduling, swap space management RAID, disk cache.

File management-concept, access methods, directory structure, file sharing, file system structure implementation, directory implementation allocation methods, free space managment.

Module IV

Database Management Systems

Database concepts, relational database-relational algebra, relational calcules (TRC & DRC) SQL – basic structure set operation, DDL, DML, embedded SQL, QBE.

Database Design: ER Model, constraints & Keys, ER diagram. UML Relational database design – normal forms 1st to 5th , BCNF). Integrity and security domain constraints,

referential integrity, assertions, triggers.

File structures- indexing & hashing. Query optimization. Transaction management concurrency control, recovery systems and dead lock.

Parallel & distributed databases, objected-oriented and object relational DBMS (basic ideas only).

Network fundamentals-LAN, MAN, WAN, Wireless networks. Data communication-channel capacity, features of transmission media (twisted pair, coaxial cables, fiber optic cables, wireless). Multiplexing, switching nanoband and broadband ISDN, ATM.

Computer networks-Topology, Transmission models, categories of networks, transmission media (Twisted pair, coaxial cable, optical, satellite, cellular telephony, terrestrial microwave). OSI and TCP/IP modes.

Physical layer – Digital data transmission, parallel and serial transmission, DTE-DCE, Modems-multiplexing FDM, TDM, WDM. Switching-packet, circuit, message/

Data Link layer-Single bit & burst error, error detectiion, URC, LRC, CRC. Data compression – Hoffman code. Flow control and Error control, ethernet, CSMA/CD, TOKEN BUS.

Network layer – Reapeating, bridges, routers gateways. Logical addressing internet protocols, address mapping (IP Address), error IPU 4 & IPU 6 reporting and multicasting, delivery, forwarding and routing algorithm – distance vector Link state, dijlestra algorithm.

Transport layer: UDP, TCP & SCTP, congestion cotnrol and quality of service. Application layer- DNS, remote logging, file transfer, WWW & HTTP.

Module V – Software Engineering

Introduction to software Engineering, software engineering paradigms, process models, product and process, software, characteristics of software, software development life cycles, generic view of process, waterfall model, prototyping, spiral model, timeboxing, RAD, interative model. Comparison of different life cycle models, software project management project estimation techniques, software requirements analysis and specification, characteristics of SRS, components of SRS,metrics, quality metrics planning of project, effort estimation, risk management teqniques, project scheduling, PERT, GANTT charts.

Problem partitioning, abstraction, modularity, coupling, coheison, top down, bottom up strategies structured design/structured analysis (SA/SD), DID components, ER diagrams, decersion trees, decision tables, structured English, transform analysis.

Object oriented analysis and design, objects attributes and methods, encapsulation, information hiding, messages, inheritance, polymorphism, UML, UML diagram, use case, class diagrams, sequence diagram, collaboration diagrams, state chart diagrams, activity diagrams, component diagrams, deployment diagrams, common coding errors, code inspection, code standards, source code control, code verification static analysis, testing, test plan, test cases, testing techniques and strategies – white box testing, basic path testing, condition testing, control and dataflow testing course effect graphing, cyclimatic complexity, black box testing, equivalance class partitioning, boundary value analysis, unit testing, integrating testing, verification and validation, system testing – load testing, performance, runtime, stress testing, recovery testing, acceptance testing.

Software configuration management, software quality assurance, quality management, TQM, agile programming, extreme programming, formal methods, CASE tools, sin sigma tools, CMMI, CMM levels.

<u>**Module VI – Programming Languages**</u>

C programming – Basic concepts, arrays, functions, pointers, structures, files.

Object oriented programming – concepts, comparison with structural programming, classes and objects, data abstraction, encapsulation inheritence, polymorphism, dynamic binding, message passing, advantages – reusability, maintenance, security.

Access modifiers, static members, friend function constructors and destructors, polymorphism, operator overloading, inheritance, virtual base classes.

Java programming, brief history, java basics, data types, variables and arrays, operators, control statements, classes and methods, inheritance, exception handling – multi threading, stream I/O string handling packages. Inheritance and interface, deriving classes, method overriding, method overloading, access modifiers, abstract class and method, interfaces, packages imports and class path, exception handling try-catch-finally clause, threads, creating threads in applications, method in thread class, threads in applets. Java applets, windows, graphics and multimedia in Java, Java APIS, IO packages, Java input stream classes, Java output stream classes, file class, graphic and sound, AWT and swing, graphic methods, fonts, loading and viewing images, loading and playing sound, AWT & Event handling network programming, IP address & port numbers, URLs, client and server concept, port and socket, server socket, simple server and client program, java beans – properties and methods, event model, introspection, customisers and property editors, persistent storage. JDBC, RMI – Defining the remote interface, implemeting the remote interface, servelet overview – basic servelet architecture, servelet form processing, session management, database management, Javascript: Objects names literals and operators and expression statements, function,s events, windows documents forms.

Module -VII
Recent developments in Computer Science

<u>**PART - II**</u>

GENERAL KNOWLEDGE AND CURRENT AFFAIRS

General Knowledge and Current Affairs

RENAISSANCE IN KERALA

TOWARDS A NEW SOCIETY

Introduction to English education - various missionary organisations and their functioning-founding of educational institutions, factories, printing press etc.

EFFORTS TO REFORM THE SOCIETY

(A) Socio-Religious reform Movements

SNDP Yogam, Nair Service Society, Yogakshema Sabha, Sadhu Jana Paripalana Sangham, Vaala Samudaya Parishkarani Sabha, Samathwa Samajam, Islam Dharma Paripalana Sangham, Prathyaksha Raksha Daiva Sabha, Sahodara Prasthanam etc.

(B) Struggles and Social Revolts

Upper cloth revolts.Channar agitation, Vaikom Sathyagraha, Guruvayoor Sathyagraha, Paliyam Sathyagraha. Kuttamkulam Sathyagraha, Temple Entry Proclamation, Temple Entry Act .Malyalee Memorial, Ezhava Memorial etc.Malabar riots, Civil Disobedience Movement, Abstention movement etc.

ROLE OF PRESS IN RENAISSANCE

Malayalee, Swadeshabhimani, Vivekodayam, Mithavadi, Swaraj, Malayala Manorama, Bhashaposhini, Mathnubhoomi, Kerala Kaumudi, Samadarsi, Kesari, AI-Ameen, Prabhatham, Yukthivadi, etc

AWAKENING THROUGH LITERATURE

Novel, Drama, Poetry, *Purogamana Sahithya Prasthanam, Nataka Prashtanam*, Library movement etc

WOMEN AND SOCIAL CHANGE

Parvathi Nenmenimangalam, Arya Pallam, A V Kuttimalu Amma, Lalitha Prabhu.Akkamma Cheriyan, Anna Chandi, Lalithambika Antharjanam and others

LEADERS OF RENAISSANCE

Thycaud Ayya Vaikundar, Sree Narayana Guru, Ayyan Kali.Chattampi Swamikal, Brahmananda Sivayogi, Vagbhadananda, Poikayil Yohannan(Kumara Guru) Dr Palpu, Palakkunnath Abraham Malpan, Mampuram Thangal, Sahodaran Ayyappan, Pandit K P Karuppan, Pampadi John Joseph, Mannathu Padmanabhan, V T Bhattathirippad, Vakkom Abdul Khadar Maulavi, Makthi Thangal, Blessed Elias Kuriakose Chaavra, Barrister G P Pillai, TK Madhavan, Moorkoth Kumaran, C. Krishnan, K P Kesava Menon, Dr.Ayyathan Gopalan, C V Kunjuraman, Kuroor Neelakantan Namboothiripad, Velukkutty Arayan, K P Vellon, P K Chathan Master, K Kelappan, P. Krishna Pillai, A K Gopalan, T R Krishnaswami Iyer, C Kesavan. Swami Ananda Theerthan , M C Joseph, Kuttippuzha Krishnapillai and others

LITERARY FIGURES

Kodungallur Kunhikkuttan Thampuran, KeralaVarma Valiyakoyi Thampuran, Kandathil Varghesc Mappila. Kumaran Asan, Vallathol Narayana Menon, Ulloor S Parameswara Iyer, G Sankara Kurup, Changampuzha Krishna Pillai, Chandu Menon, Vaikom Muhammad Basheer. Kesav Dev, Thakazhi Sivasankara Pillai, Ponkunnam Varky, S K Pottakkad and others

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.