Syllabus for Ph.D. (PET) Entrance Exam
Paper 2: Programme Specific (Computer Science and Engineering)

1. **Design and Analysis of Algorithm**: Growth of Functions, Divide-and-Conquer, Probabilistic Analysis and Randomized Algorithms, Greedy Strategy, Dynamic Strategy, Heap sort, Quicksort, Sorting in Linear Time, Hash Tables, Binary Search Trees, Red-Black Trees, Dynamic Programming, Greedy Algorithms, B-Trees, Elementary Graph Algorithms, Minimum Spanning Trees, Single-Source Shortest Paths, All-Pairs Shortest Paths.

2. **Operating System :** Operating-System Structures, Process Management: Processes, Threads, CPU Scheduling, Process Synchronization, Deadlocks, Memory Management: Main Memory, Virtual Memory, And Storage Management: File-System Interface, File-System Implementation, Mass Storage Structure, I/O Systems, Protection And Security: Protection, Security, Distributed Systems: Distributed System Structures, Distributed File Systems, Real-Time Systems, Multimedia Systems, the I/O Subsystem, Interposes Communication, Multiprocessor Systems, Distributed UNIX Systems.

3. **Database Systems:** Relational DBMS, SQL: Queries, Constraints, Triggers, Database Application Development, Internet Applications, Disks and Files data storage, Tree Structured Indexing, Hash-Based Indexing, Overview of Query Evaluation, External Sorting, Evaluating Relational Operators, A Typical Relational Query Optimizer, Transaction Management, Concurrency Control, Crash Recovery, Schema Refinement and Normal Forms

4. **Computer Networking:** Introduction to Computer Networks, OSI reference model, TCPIP protocol Suite Physical Layer , Data Link Layer, Network Layer, Transport Layer, Application Layer, Network Security, Advanced Topics

5. **Programming Languages**: Overview of the main programming paradigms: imperative vs declarative, structured, object-oriented, concurrent, functional, Structured, imperative programming in C, Syntax, type system, control flow, build/debugging tools, Dynamic memory allocation, pointers, Introduction to Object Oriented programming C++, java, high performance computing, systems/kernel programming, Principles of Design Patterns

6. **Reference Books:**

1. Sipser, M. (2012). *Introduction to the theory of computation* (3rd ed.). Cengage Learning.
2. Silberschatz, A., Galvin, P. B., & Gagne, G. (2016). *Operating system concepts* (9th ed.). Wiley.
3. Gonzalez, R. C., & Woods, R. E. (2008). *Digital image processing* (3rd ed.). Pearson Prentice Hall.
4. Sebesta, R. W. (2019). *Concepts of programming languages* (12th ed.). Pearson.
5. Schildt, H. (2019). *Java: The complete reference* (11th ed.). McGraw-Hill Education.
6. Silberschatz, A., Korth, H. F., & Sudarshan, S. (2020). *Database system concepts* (7th ed.). McGraw-Hill Education.