INDIAN STATISTICAL INSTITUTE

Recruitment for posts of
Associate Scientist A
(*Specialization: Computer Science*)

Syllabus for Online and Skill Tests

- **Basics:** I/O Devices, Processing Unit, Memory (Register, Cache Memory, Primary Memory, Secondary Memory).

- **Data Structures:** Array, Stack, Queue, Linked List, Binary Tree, Sorting, Searching, Hashing.

- **Programming Languages:** Fundamental Concepts, Control Flow, Procedure Call and Parameter Passing, Memory Allocation, C and C++/ Java/ Python Programming.

- **Operating Systems:** Memory Management, Processor Management, Deadlocks, Device Management, File Systems.

- **Computer Organization and Architecture:** Number Representation, Computer Arithmetic, Memory Organization, I/O Organization, Microprogramming, Pipelining.

- **Database Management Systems:** Entity-Relationship Model, Relational Data Model, Functional Dependency, Normalization (1NF, 2NF, 3NF and BCNF), SQL.

- **Computer Networks:** LAN, MAN, WAN, Wireless LAN, MAC Protocols, Routing, TCP/IP, IP Addressing, IPv4, Error Detection/ Correction, Inter-networking.

- **GNU/Linux System Administration:** Installation of Operating Systems, Installation and Uninstallation of Software Packages, Management of User Accounts, Use of Command-line Interface / Shell (*bash*) and Command-line Utilities (*cat, cd, cmp, cp, diff, df, du, find, grep, gzip, gunzip, less, ls, man, mkdir, more, mv, pwd, rm, rmdir, sudo, tar, etc.*), Commonly Used Editors, Compilers (*gcc*), Debuggers (*gdb*), Remote Access Tools (*ssh, scp, sftp, etc.*), Basic Shell Scripting, Tools for System Monitoring (*ps, top, etc.*), Backups and Cronjobs, Management of Basic Firewalls, NAT, VPN.

- **Windows System Administration:** Installation of Operating Systems, Installation and Uninstallation of Software Packages, Management of User Accounts, Management of Disk, Management of Registry, Monitoring of System.

- **Web Technology:** HTML, Dynamic HTML, XML, CSS, Clients-Servers Communication.

Sample Questions for the Online Test

Note: For each of the questions there are four suggested answers, of which only one is correct. You will score

> *4 marks for each correctly answered question,*
> *0 mark for each incorrectly answered question, and*
> *1 mark for each unattempted question.*

1. Indicate which one of the following IP addresses is a valid host address?

   (a) 192.168.72.63/26   (b) 192.168.72.64/26
   (c) 192.168.72.127/27   (d) 192.168.72.255/20

2. Consider the following C program segment

   > *int num = 11;*
   > *for (num− −; num− −; num− −)*
   > *;*
   > *printf ("%d", num);*

   The output of the program is

        (a) − 1   (b) 0   (c) 1   (d) None of these   .

3. Suppose a complete binary tree is represented with an array by placing the root node at index 0, and the left and right children of any arbitrary node at index i at the indices $2i+1$ and $2(i+1)$, respectively. If the array elements are given as $\{2, 3, 5, 7, 11, 9, 13\}$, then the post-order traversal on this tree will yield

   (a) $2, 3, 7, 11, 5, 9, 13$ (b) $2, 5, 13, 9, 3, 11, 7$
   (c) $13, 9, 11, 7, 5, 3, 2$ (d) $7, 11, 3, 9, 13, 5, 2$

4. Multiplication of the two numbers 7 and –3, using the Booth's algorithm, will return

        (a) 00010101   (b) 10010101   (c) 01101011   (d) 11101011   .

5. You are given a relational schema $R = (A, B, C, D)$ with atomic attributes, for which the set of functional dependencies $\{A \to B, B \to D, B \to C\}$ hold. The decomposition of R into $3NF$ relations contains

   (a) AB and BCD (b) AD and $ABCD$
   (c) BD and $ABCD$ (d) BC and AD

6. The relocation register helps in

        (a) providing more address space to processes.
        (b) providing a different address space to each process.
        (c) protecting the address spaces of processes.
        (d) none of the above.

7. What does the following command do?
   > *sudo /usr/bin/du -sm ./* > output*

   (a) Dumps the contents of all files in the current directory into one single file called output.

   (b) Deletes all files and directories in the current directory and saves error messages in a file called output.

(c) Create a file called output containing the list of all files and directories in the current directory along with the space occupied by them.

(d) Create a directory called output containing duplicate copies of all files and directories in the current directory.

8. A system has m processes competing for n resources such that each process may require at most n_{max} resources. Which one of the following relations ensures no deadlock?

(a) $mn_{max} > n$ (b) $mn_{max} \geq n$ (c) $mn_{max} \leq n$ (d) $m = n_{max} + n$.

9. Suppose you need to transfer a single 16 GB file containing a high definition video. Which of the following would be the most appropriate for the task?

(a) A DVD-R with Dual Layer
(b) A pen drive of capacity 16 GB in FAT32 format
(c) A pen drive of capacity 32 GB in FAT32 format
(d) None of the above

10. Consider the following HTML code:

<p class= "isi" id= "Y1931"> There is a dinosaur named after Indian Statistical Institute (ISI) called < i > Isisaurus < /i > . < /p >

which includes the following CSS code:

.isi{color: green;}
#Y1931{color: red;}
p{color: blue;}

The color of the output of the above HTML code is

(a) black   (b) red   (c) green   (d) blue   .

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