GATE CS & IT 2025 Shift 1 Question Paper

Time Allowed :3 Hours	**Maximum Marks :**100	**Total Questions :**65

1. Let A be a 3×3 matrix defined as:

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & -1 \end{bmatrix}$$

Find the eigenvalues of A^{13}. **[2]**

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2. Match the following layers with their corresponding functionalities:

- Networking Layer
- Transport Layer
- Data Link Layer

Options for matching:

- Host-to-host communication
- Data packet transfer
- Error detection and correction

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3. What is the output of the following C code?

```
void foo(int *p, int x) {
    *p = x;
}
```

```
void main() {
    int *z;
    int a = 20, b = 25;
    z = &a;
    foo(z, b);
    printf("%d", a);
}
```

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4. Find the signed binary expansion of the number -6.

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5. Which of the following is the greatest?

$$0.\overline{6}, \quad 0.666, \quad \frac{5}{6}, \quad \frac{2}{3}$$

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6. Given the following information:

- The logical address (L.A.) is 32 bits.
- The physical address (P.A.) is 20 bits.
- The page size (P.S.) is 2048 bytes (2 KB).

What is the maximum number of entries in the page table?

- 1. 2^{10}
- 2. 2^{12}
- 3. 2^{20}
- 4. 2^{22}

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7. The TCP connection establishment process involves a 3-way handshake. Which of the following steps correctly represents the 3-way handshake?

- 1. SYN $\rightarrow$ SYN-ACK $\rightarrow$ ACK
- 2. SYN $\rightarrow$ ACK $\rightarrow$ SYN-ACK
- 3. ACK $\rightarrow$ SYN $\rightarrow$ SYN-ACK
- 4. SYN $\rightarrow$ ACK $\rightarrow$ ACK

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8. What is the time complexity of the following algorithm?

```
int func(int n) {
    for (int i = 1; i <= n; i++) {
        for (int j = 1; j <= n; j++) {
            printf("Hello");
        }
    }
}
```

Options:

- 1. $O(n)$
- 2. $O(n^2)$
- 3. $O(n^3)$
- 4. $O(\log n)$

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9. Consider the following operations on an initially empty stack:

- Push 10
- Push 20
- Pop

- Push 30
- Pop
- Push 40

What is the final content of the stack?

Options:

- 1. 10, 40
- 2. 40, 20
- 3. 40, 10
- 4. 30, 40

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10. Which of the following is true about the binary search algorithm when applied to a sorted array?

Options:

- 1. It always has a time complexity of $O(n)$
- 2. It works on unsorted arrays
- 3. It divides the search space into two equal halves on each iteration
- 4. It requires that the array be sorted in descending order