| QN | PART-A | | | | PART-B | | | | | | PART-C | | | | | | Grand Total |
|----|--------|---|---|---|------|---|---|---|---|------|---|---|---|---|---|---|
|    | E-1    | E-2 | AC | QN | E-1 | E-2 | AC | QN | E-1 | E-2 | AC | PART-A | PART-B | PART-C | Total | (-) Marks | Final Total |
| 1  |        |     |    | 21 |      |     |    | 33 |      |     |    |        |        |        |       |            |            |
| 2  |        |     |    | 22 |      |     |    | 34 |      |     |    |        |        |        |       |            |            |
| 3  |        |     |    | 23 |      |     |    | 35 |      |     |    |        |        |        |       |            |            |
| 4  |        |     |    | 24 |      |     |    | 36 |      |     |    |        |        |        |       |            |            |
| 5  |        |     |    | 25 |      |     |    | 37 |      |     |    |        |        |        |       |            |            |
| 6  |        |     |    | 26 |      |     |    | 38 |      |     |    |        |        |        |       |            |            |
| 7  |        |     |    | 27 |      |     |    | 39 |      |     |    |        |        |        |       |            |            |
| 8  |        |     |    | 28 |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 9  |        |     |    | 29 |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 10 |        |     |    | 30 |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 11 |        |     |    | 31 |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 12 |        |     |    | 32 |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 13 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 14 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 15 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 16 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 17 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 18 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 19 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| 20 |        |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |
| Total |      |     |    |    |      |     |    |    |      |     |    |        |        |        |       |            |            |

Marks In Words

Remarks of Evaluator/Chief Examiner

Remarks of Scrutiniser

Evaluator's Sign

For Evaluator's Use Only
Note: Attempt all the twenty questions. Each question carries 2 marks. Answer should not exceed 15 words.

1. Differentiate kernel and shell.

2. Write four necessary conditions for deadlock.

3. What factor(s) contribute to thrashing in an operating system?
A memory from address 000H to FFFFH stores four jobs from address 111H to 332H, 449H to 62FH, 333H to 460H and 888H to FFFH. How many holes are there if 000H to 110H is allocated to OS?

5. Consider hashing function \( h_{k+1}(x) = (h_k(x) + k) \mod 11 \). \( h_1(x) = x \mod 11 \). What should be the value of \( h_3(24) \).

6. For a grammar
   \[ s \rightarrow \alpha \beta a \]
   \[ s \rightarrow \beta \alpha b \]
   \[ s \rightarrow \varepsilon \]

   Find whether ababbba is an acceptable string or not. Justify answer.
Apply operator strength reduction and loop folding optimization in the following code and
give output.

DO I = 1 to 3
  A(J + 1) = 0.0
END
K = L * 2

8 Write pumping lemma for regular grammar.

9 Enumerate three differences between CSMA/CD and CSMA/CA.
10. What are the typical ranges of class A, class B and class C IPv4 address?

11. What are advantages of packet switching over circuit switching?

12. What are ARP and RARP?
13. What are the phases of waterfall model?

14. Describe one approach to identify object class in object oriented analysis.

15. What is integration testing?
16. What is information contained in a symbol table?

17. Differentiate between raster and random scan.

18. What is clipping?
19. What is affine transformation?

20. Why are homogeneous coordinates used in graphics algorithms?
Note: Attempt all the twelve questions. Each question carries 5 marks. Answer should not exceed 50 words.

21 Consider 3 processes P1, P2, P3 shown as under:

<table>
<thead>
<tr>
<th>Process</th>
<th>Arrival Time</th>
<th>Time units Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>P2</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>P3</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Explain the completion order of the 3 processes under First come first serve and round robin scheduling with CPU quantum of 2 time units.
Consider a 2-level cache system. CPU tries to access data from L1 cache and if data is not found there, it tries to read data from L2 cache and then from RAM. Hit rate of L1 and L2 cache are 95% and 90% respectively. On an average, a CPU takes 2 cycles to read from L1, 5 cycles to read from L2 and 25 cycles to read from RAM. What is average access time?

23 Given memory partitions of 100 k, 500 k, 200 k, 300 k and 600 k (in order). How would each of the first fit, best fit and worst fit algorithm place processes of 212 k, 417 k, 112 k, 426 k (in order as given)? Which algorithm makes the best use of memory?
For an NFA given as

\( F = (\{q_0, q_1, q_2, q_3\}, \{a, b, c\}, \Delta, q_0, \{q_4\}) \) with transition table:

<table>
<thead>
<tr>
<th>State</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>( q_0 )</td>
<td>{q_0, q_1}</td>
<td>{q_0, q_2}</td>
<td>{q_0, q_3}</td>
</tr>
<tr>
<td>( q_1 )</td>
<td>{q_1, q_4}</td>
<td>{q_1}</td>
<td>{q_1}</td>
</tr>
<tr>
<td>( q_2 )</td>
<td>{q_2}</td>
<td>{q_2, q_4}</td>
<td>{q_2}</td>
</tr>
<tr>
<td>( q_3 )</td>
<td>{q_3}</td>
<td>{q_3}</td>
<td>{q_3, q_4}</td>
</tr>
<tr>
<td>( q_4 )</td>
<td>(\emptyset)</td>
<td>(\emptyset)</td>
<td>(\emptyset)</td>
</tr>
</tbody>
</table>

Find whether string \( aca \) is acceptable or not.
Discuss in brief three techniques of code optimization.

26 Differentiate switches, hubs and routers in terms of:
   (a) Access mechanism
   (b) Collision.
Path MTU is the smallest MTU of any link on the current path (route) between two hosts. Path MTU is of size 512 bytes. Message contains 2048 bytes and 20 bytes of header. All IP headers are 20 bytes. Give the sizes and offset of the sequence of fragments delivered to network layer at the destination. Assume suitable data if necessary.

Name two quality control approaches and explain quality review approach in context of software engineering.
What are merits and demerits of white-box testing with respect to black-box testing?

Given two raster systems with resolution $640 \times 480$ and $1280 \times 1024$. What size frame buffer is needed for each of these systems to store 12 bits per pixel? How much storage is required for each system if 24 bits per pixel are needed to be stored?
31. Why do we need antialiasing in Graphics? Explain how can this be achieved?

32. What are the steps involved in 3D transformation? Define vanishing point.
Note: Attempt any 5 questions. Each question carries 20 marks. Answer should not exceed 200 words.

33. Develop regular expressions for a number expressed in exponential form. Both mantissa and exponent are represented in decimal representation (+2.3, -3.68). Examples of such numbers in exponential form are 2E4, 3e5, -7E-7 (Here mantissa is real number before e/E and exponent is real number after e/E).
Explain the parameters used in macro name table (MNT). For the following code generate MNT and various tables used in MNT.

MACRO
CLEARMEM &X, &N, &REG = AREG
LCL &M
SET 0
MOVER &REG = 'O'
MORE MOVEM &REG, &X + &M
&M SET &M+1
AIF (&M NE N), MORE
MEND
For the network given in the following figure, obtain global distance-vector under the conditions:

(a) Each node knows only the distances to its immediate neighbours.
(b) Each node has reported the information it had in the preceding steps to its immediate neighbour.
(c) Step (b) happens a second time.
36 Show that the following languages are context free by exhibiting context free grammar generated in the following:

(a) \{a^m b^n c^p d^q : m + n = p + q\}
(b) \{a^m b^n : m \leq 2n\}
Consider a quadratic B-Spline curve with uniform knot spacing. Consider a segment with control points \((1, 0), (1, 1)\) and \((0, 1)\) in that order. What are the end points of the curve segment? What is the mid-point of the curve segment?
Describe four types of reliability metrics in context of software Engg.
In compilers, what are the different ways intermediate code can be represented. Discuss how (a) switch statement and (b) for statement can be represented as control flow graph. Label basic blocks clearly.

```
pre-block;
switch (value) {
    case value1:  
        statement1;
        break;
    case value2:  
        statement2;
        break;
    default:  
        statement;
        break;
}
post-block;
```