Parallel and Distributed Computing – Solved Numerical Questions

Q1.

A program takes 120 seconds on one processor and 30 seconds on 4 processors. Calculate the speedup and efficiency.

Solution:
Speedup = Sequential Time / Parallel Time

Speedup = 120 / 30 = 4

Efficiency = (Speedup / Number of Processors) × 100

Efficiency = (4 / 4) × 100 = 100%

Answer: Speedup = 4, Efficiency = 100%

Q2.

A task executes in 200 seconds sequentially and 50 seconds on 5 processors. Find the speedup and efficiency.

Solution:
Speedup = 200 / 50 = 4

Efficiency = (4 / 5) × 100 = 80%

Answer: Speedup = 4, Efficiency = 80%

Q3.

A parallel application requires 150 seconds on one processor and 25 seconds on 6 processors. Calculate the speedup and efficiency.

Solution:
Speedup = 150 / 25 = 6

Efficiency = (6 / 6) × 100 = 100%

Answer: Speedup = 6, Efficiency = 100%

Q4.

A system with 8 processors achieves a speedup of 6. Calculate the efficiency.

Solution:
Efficiency = (6 / 8) × 100

Efficiency = 75%

Answer: Efficiency = 75%

Q5.

A program takes 180 seconds sequentially and 45 seconds on 4 processors. Determine the speedup and efficiency.

Solution:
Speedup = 180 / 45 = 4

Efficiency = (4 / 4) × 100 = 100%

Answer: Speedup = 4, Efficiency = 100%

Q6.

A parallel system with 10 processors achieves a speedup of 8. Calculate the efficiency.

Solution:
Efficiency = (8 / 10) × 100

Efficiency = 80%

Answer: Efficiency = 80%

Q7.

A task runs in 90 seconds on one processor and 15 seconds on 5 processors. Find the speedup and efficiency.

Solution:
Speedup = 90 / 15 = 6

Efficiency = (6 / 5) × 100 = 120%

Answer: Speedup = 6, Efficiency = 120%

Q8.

A program takes 300 seconds on one processor and 60 seconds on 8 processors. Calculate the speedup and efficiency.

Solution:
Speedup = 300 / 60 = 5

Efficiency = (5 / 8) × 100

Efficiency = 62.5%

Answer: Speedup = 5, Efficiency = 62.5%

Q9.

A parallel machine with 16 processors achieves a speedup of 12. Determine the efficiency.

Solution:
Efficiency = (12 / 16) × 100

Efficiency = 75%

Answer: Efficiency = 75%

Q10.

A job takes 240 seconds on one processor and 40 seconds on 8 processors. Calculate speedup and efficiency.

Solution:
Speedup = 240 / 40 = 6

Efficiency = (6 / 8) × 100

Efficiency = 75%

Answer: Speedup = 6, Efficiency = 75%

Q11.

A workload of 2400 units is distributed equally among 6 processors.

Solution:
Workload per Processor = 2400 / 6

= 400 units

Answer: 400 units per processor

Q12.

A dataset of 10,000 records is divided equally among 5 servers.

Solution:
Records per Server = 10000 / 5

= 2000 records

Answer: 2000 records per server

Q13.

A file of size 1.2 GB is distributed among 8 processors.

Solution:
Data per Processor = 1.2 / 8

= 0.15 GB

Answer: 0.15 GB per processor

Q14.

A distributed database contains 36,000 records stored equally on 12 nodes.

Solution:
Records per Node = 36000 / 12

= 3000 records

Answer: 3000 records per node

Q15.

A task consisting of 4500 operations is divided equally among 9 processors.

Solution:
Operations per Processor = 4500 / 9

= 500 operations

Answer: 500 operations per processor

Parallel and Distributed Computing – Solved Numerical Questions (Q16–Q30)

Q16.

A data file of 900 MB is shared among 15 nodes. Calculate the amount of data per node.

Solution:
Data per Node = Total Data / Number of Nodes

Data per Node = 900 / 15

Data per Node = 60 MB

Answer: 60 MB per node

Q17.

A parallel system distributes 3,200 tasks equally among 16 processors. Determine the tasks per processor.

Solution:
Tasks per Processor = Total Tasks / Number of Processors

Tasks per Processor = 3200 / 16

Tasks per Processor = 200

Answer: 200 tasks per processor

Q18.

A workload of 8,400 units is divided among 14 processors. Calculate the workload assigned to each processor.

Solution:
Workload per Processor = Total Workload / Number of Processors

Workload per Processor = 8400 / 14

Workload per Processor = 600 units

Answer: 600 units per processor

Q19.

A 720 GB dataset is equally distributed across 18 servers. Find the storage required per server.

Solution:
Storage per Server = Total Storage / Number of Servers

Storage per Server = 720 / 18

Storage per Server = 40 GB

Answer: 40 GB per server

Q20.

A distributed application divides 5,000 requests among 20 servers. How many requests does each server handle?

Solution:
Requests per Server = Total Requests / Number of Servers

Requests per Server = 5000 / 20

Requests per Server = 250

Answer: 250 requests per server

Q21.

A message of size 2,000 KB is sent through a network with bandwidth 500 KB/s. Calculate the transmission time.

Solution:
Transmission Time = Message Size / Bandwidth

Transmission Time = 2000 / 500

Transmission Time = 4 seconds

Answer: 4 seconds

Q22.

A file of 1,500 MB is transferred over a network at 300 MB/s. Find the transfer time.

Solution:
Transfer Time = File Size / Transfer Rate

Transfer Time = 1500 / 300

Transfer Time = 5 seconds

Answer: 5 seconds

Q23.

A message of 900 KB is transmitted through a channel with bandwidth 150 KB/s. Determine the transmission time.

Solution:
Transmission Time = Message Size / Bandwidth

Transmission Time = 900 / 150

Transmission Time = 6 seconds

Answer: 6 seconds

Q24.

A distributed system transfers a 4,000 MB file over a network operating at 800 MB/s. Calculate the transfer time.

Solution:
Transfer Time = File Size / Transfer Rate

Transfer Time = 4000 / 800

Transfer Time = 5 seconds

Answer: 5 seconds

Q25.

A message of size 5,000 KB is sent over a network with a bandwidth of 1,000 KB/s. Find the transmission time.

Solution:
Transmission Time = Message Size / Bandwidth

Transmission Time = 5000 / 1000

Transmission Time = 5 seconds

Answer: 5 seconds

Q26.

A parallel machine has 20 processors, of which 15 are active. Calculate the processor utilization percentage.

Solution:
Processor Utilization = (Active Processors / Total Processors) × 100

Processor Utilization = (15 / 20) × 100

Processor Utilization = 75%

Answer: 75%

Q27.

A cluster contains 25 nodes. If 20 nodes are operational, determine the percentage of operational nodes.

Solution:
Operational Percentage = (Operational Nodes / Total Nodes) × 100

Operational Percentage = (20 / 25) × 100

Operational Percentage = 80%

Answer: 80%

Q28.

Each processor can execute 400 instructions per second. If there are 10 processors, calculate the total execution capacity.

Solution:
Total Capacity = Instructions per Processor × Number of Processors

Total Capacity = 400 × 10

Total Capacity = 4000 instructions/second

Answer: 4000 instructions per second

Q29.

A distributed system has 12 servers, each capable of processing 750 requests per minute. Determine the total processing capacity.

Solution:
Total Capacity = Capacity per Server × Number of Servers

Total Capacity = 750 × 12

Total Capacity = 9000 requests/minute

Answer: 9000 requests per minute

Q30.

A parallel computer contains 32 processors. If only 24 processors are being used, calculate the processor utilization percentage.

Solution:
Processor Utilization = (Used Processors / Total Processors) × 100

Processor Utilization = (24 / 32) × 100

Processor Utilization = 75%

Answer: 75%

*** The End ***