Answer Key (Solution)

Mid-Term Examination

B.Tech. 5th Semester, Odd Semester 2021-22

Department of Computer Science Engineering

BENNETT UNIVERSITY, GREATER NOIDA, INDIA

COURSE CODE: ECSE304L MAX. DURATION: 60 Minutes

COURSE NAME: Cloud Computing

COURSE CREDIT: 04 MAX. MARKS: **60**

Section I (Easy) (1*15=15 Marks)

1. Bucket is a flat organization of containers, used for:

   a. Object Storage
   b. Block Storage
   c. Cluster Storage
   d. Elastic Block Storage

2. Why does the Internet Gateway and NAT Gateway carry the IP address 0.0.0.0/0.

   a. Both are created implicitly by AWS on user's request.
   b. NAT Gateway is created over Internet Gateway.
   c. 0.0.0.0/0 is a special address.
   d. NAT Gateway resides in public subnet.

3. A demo security group is attached to a Linux AMI. The security group configuration is dictated by the following command.

   aws ec2 authorize-security-group-ingress --group-name demo --protocol all --cidr 0.0.0.0/0

   What traffic is allowed for the Linux Instance?

   a. Incoming traffic only.
   b. All incoming and outgoing traffic.
   c. No SSH is allowed.
   d. Special address association must be defined.

   Solution: Security group is stateful so, all the incoming as well as outgoing traffic will be allowed.

4. How many subnets are present in the default AWS VPC:

   a. One subnet for each availability zone.
   b. 3

c. One public and One private subnet.
d. User defined.

5. The RSA key (linux.pem) is copied to another file (windows.pem). The user runs the following command

   chmod 700 windows.pem

   What desired effect will it have on the AWS RSA Key.

   a. The key cannot be overwritten or corrupted by another user.
   b. The private key is generated.
   c. Instances sharing the same security group can be launched using the key.
   d. Complete control of the key is reserved by the issuing root user.

   Solution: The most suitable answer is option d

6. Which of the following statement is true:

   a. NACL cannot be associated with more than 1 subnet.
   b. Subnet cannot have an IP CIDR block which is the same as VPC.
   c. Security Groups are the first line of defence for an Instance.
   d. Multiple routing tables are possible for a single subnet.

7. Mark the correct options. The Dimensions of scalability characterization of any cloud-based system are
   a. Infrastructure Size Scalability
   b. Platform Scalability
   c. Software Scalability
   d. All of the option

8. As per the AWS responsibility model, the customer is responsible for
   a. Physical security of data center
   b. Securing software solutions
   c. Securing hardware infrastructure
   d. Encryption of data

9. Ria and Aryan both are planning to use AWS EC2 Instances for the college project as the Cloud Infrastructure. In general, they can get maximum discounts by selecting from the following. (Choose any two options)

   a. Reserved Instances
   b. On-Demand
   c. Dedicated Hosts
   d. Spot Instance
   e. Pay per use basis

10. Mr. Glen, a company owner wants to run a highly available web tier by using two EC2 instances and a load balancer. Which design logic is well suited for the highest availability?

    a. Two different subnets in the same Availability Zone. Each subnet contains one EC2 instance.
    b. Two different subnets, one per Availability Zone. Each subnet contains one EC2 instance.
    c. One subnet, which spans two Availability Zones. Each Availability Zone contains one EC2 instance.
    d. One subnet is one Availability Zone. The subnet contains two EC2 instances.
    e. None of the options

11. AWS VPC exists at ..... level, Subnet exists at ……level, and S3 service exist at ……level.

    a. global, global, global
    b. region, availability zone, global
    c. region, global, availability zone
    d. global, availability zone, region

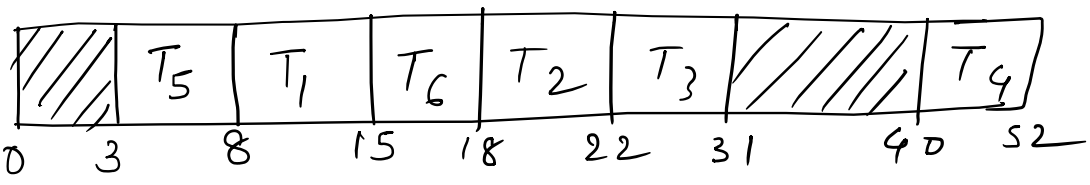
12. Consider the following set of tasks, with the arrival times, and the execution time on the virtual machine (VM) given in milliseconds

P. No.	Arrival Time	Execution time
T1	6	7
T2	9	4
T3	12	9
T4	40	12
T5	3	5
T6	8	3

What is the VM utilization?

    a. 23.0769%
    b. 52%
    c. 76.9230%
    d. None

Gantt chart



CPU utilization = $\frac{52-12}{52}$ = 76.9230%.

13. In AWS, Endpoint is created in …….. subnet and NAT gateway is created in……..subnet.
    a. Public, public
    b. Private, private
    c. Public, private
    d. None of the above

14. AWS owns and maintains the network-connected hardware required for application services, while you provision and use what you need. **Mark as True or False**

    a. True
    b. False

15. Users can visualize, understand, and manage your AWS costs and usage over time.

    a. Cost Explorer
    b. TCO
    c. CloudWatch
    d. Cloud Trail
    e. AWS Organizations

16. In AWS, Default VPC has a /20 CIDR block assigned to it. What is the maximum number of addresses available within the default VPC?
    a. 4096
    b. 4091
    c. 4094
    d. 2048

    Solution: 2^ (32-20)-5 = 4091

17. In Gartner Hype cycle, _____ phase plays an important role to decide the mainstream adoption of the invented technology and its stability in the near future.
    a. Slope of Productivity
    b. Through of enlightenment
    c. Technology Trigger
    d. Slope of enlightenment
    e. Plateau of Productivity

    Solution: In the trough of disillusionment phase, most of the customers become negative about the product. But some of the customers try to find positive aspects about the product and motivate the benefits of the product to the other users. The phase is known as the Slope of enlightenment. Therefore, we can say that the slope of enlightenment phase plays an important role to decide the plateau of productivity or mainstream adoption phase.

18. One of the advantages of moving the infrastructure from on-premises data center to the AWS cloud is:
    a. It allows the business to eliminate IT bills.
    b. It allows the business to put the servers in each customer's data center.

c. It allows the business to focus more on business activities and less on infrastructure management.
d. None of these

19. What approach for transcoding of many individual video flies adheres to AWS architecture principles? (Best suitable answer)
    a. Using many instances running parallelly.
    b. Using a single large instance during off peak hours.
    c. Using dedicated hardware
    d. Using a large GPU instance type.
20. Which feature of the AWS supports the requirement for low latency to the customers?
    a. Fault tolerance
    b. High availability
    c. Global reach
    d. Scalability
21. Which storage service can be used to host static websites as a low-cost option?
    a. Amazon Glacier
    b. Amazon DynamoDB
    c. Amazon EFS
    d. Amazon S3
22. Which Amazon EC2 instance pricing model can provide discount up to 90 %?
    a. Reserved instances
    b. On demand instances
    c. Dedicated instances
    d. Spot instances
23. The AWS VPC Firewall options that can be used to secure the VPC are
    a. Security groups
    b. NACL
    c. Both a and b
    d. User don't have access to AWS VPC Firewall options

Section II (Medium) (2.5X10=25 Marks)

1. Which command will delete the RSA key par named "bennettcoreinfrakey.pem" from the keypairs.
    a. aws ec2 delete-key-pair --key-name bennettcoreinfrakey --type rsa.
    b. aws ec2 delete-key-pair --key-name bennettcoreinfrakey.pem --type rsa.
    c. aws ec2 delete-key-pair --key-name bennettcoreinfrakey.
    d. aws ec2 delete-key-pair-rsa --key-name bennettcoreinfrakey.

    Solution: C is the correct option as the name of the encryption algorithm (i.e., RSA) is not needed at the time of deletion of key pair.

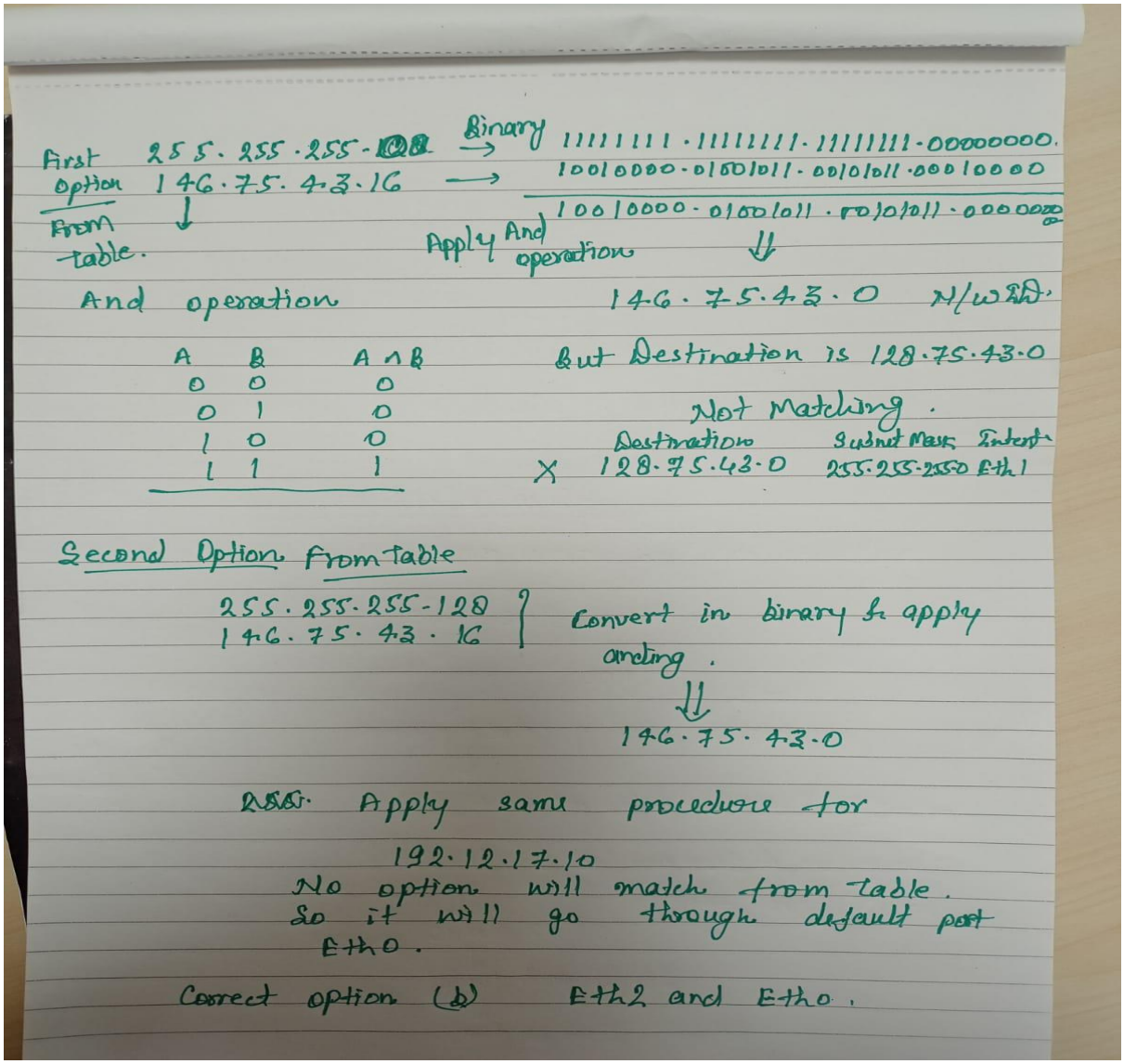
2. Consider the below given routing table

Destination	Subnet mask	Interface
128.75.43.0	255.255.255.0	Eth1
146.75.43.0	255.255.255.128	Eth2
192.12.17.15	255.255.255.255	Eth3
Default		Eth0

On which interface will the router forward packets have addressed to destinations 146.75.43.16 and 192.12.17.10 respectively

a. Eth0 and Eth2
b. Eth2 and Eth0
c. Eth0 and Eth3
d. Eth1 and Eth3

Solution:



3. Consider a class B network address 130.50.0.0. The last 7 bits of the host id are allotted for host number and the remaining 9 bits are reserved for subnet number. How many subnets and number of hosts in each subnet are possible with the above addressing scheme?

   a. 128, 512
   b. 512, 128
   c. 126, 510
   d. None of the above

   Solution:
   The network address 130.50.0.0 is of class B type so, 16 bits is fixed for network and remaining 16 bits is reserved for host. The network is further divided into multiple subnets. For the subnet, 9 bits is used and remaining 7 bits is used for host inside the subnet.
   Total number of subnets = 2^9 – 2 = 510
   Total number of hosts in each subnet = 2^7 – 2 = 126

4. Consider the following set of tasks, with the arrival times, and the execution time of the virtual machine (VM) is given in milliseconds

P. No.	Arrival time	Execution time
T1	6	7
T2	9	4
T3	12	9
T4	40	12
T5	3	5
T6	8	3

   Choose the correct option based on the makespan time (Consider the time Quantum 3 milliseconds).

   a. FCFS < SJF < SRTF < Round Robin
   b. Round Robin < SJF < SRTF < FCFS
   c. FCFS = SJF = SRTF < Round Robin
   d. SJF = SRTF = FCFS = Round Robin

   Solution: Makespan is the time when all the jobs finish execution. The tasks are appearing according to the arrival time. The task that arrives at the last is T4 at 40. The task that appears first is T5 at 3. All the tasks except T4 finishes at 31 (using any of the scheduling algorithms). T4 starts at 40 and finishes at 52. So, the makespan is 52 for all the scheduling algorithms.

5. In VPC peering, a _____ networking connection is established between two VPCs. As the number of workloads grows on AWS, we must be able to scale our networks across multiple accounts and VPCs. The VPCs can be efficiently managed using a centralized gateway named as _____.

   a. One to one, AWS transit gateway

b. Point to point, AWS transit gateway
c. Client server, AWS transit gateway
d. Client server, AWS virtual private gateway

Solution: VPC peering is point to point connection while AWS transit gateway is a centralized gateway.

6. Which of the following are the specified parameters of Service-Level-Agreement (SLA). Mark the best suited option
   a. Response time, Cost Offered, Responsibilities of each party, Warranties, User data-security at user Level, Restriction in user applications
   b. Response time, Responsibilities of each party, Warranties
   c. Response time, Warranties, User data-security at user Level
   d. Cost Offered, Warranties, User data-security at user Level,
   e. Cost Offered, Responsibilities of each party, Warranties, User data-security at user Level

   Solution: In SLA, user level data is not handled

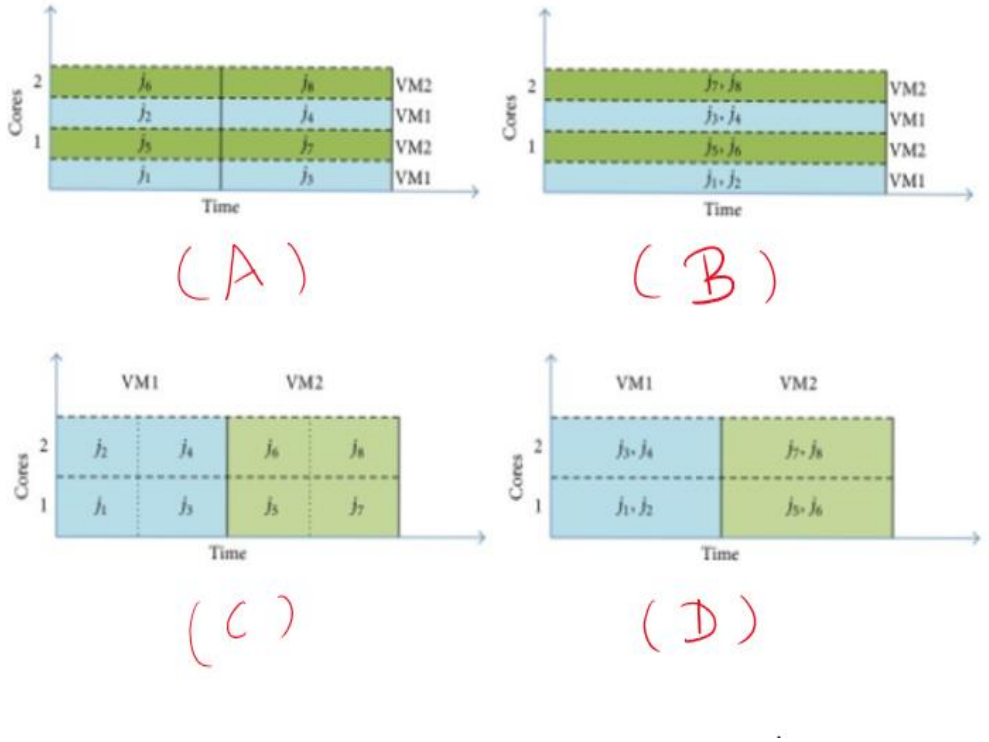
7. What are the advantages of on-premises IT over the cloud computing paradigm?
   a. Avoid large capital purchases
   b. Use on demand capacity
   c. Go global in minutes
   d. Increase speed and agility
   e. All of the options

8. While creating of AWS VPC, mark the incorrect option about its default components. (Mark Three Options)
   a. A main route table is created by default.
   b. Security group create default.
   c. EC2 instance attached by default.
   d. S3 storage Mount Volume creates default
   e. A Regional IAM role creates automatically for VPC.
9. EC2 instance can be created using various instance types. Choose any two correct statements.
   a. General purpose instance type can be used to perform variety of workloads and it provide balance between memory and CPU.
   b. Compute optimized instance is designed to provide high performance for relational and nonrelational database workload.
   c. Memory optimized instance can be designed for the workload that requires to process a large volume of sequential read and write operation for huge datasets.
   d. Accelerated computing instance can be used for live streaming and 3d gaming.
   e. Storage optimized instances require more CPU than RAM.
10. _____ is considered as an atomic unit and is a part of an _____. It consists of various dependent or independent tasks. The independent task can be represented using _____ while dependent task can be represented using _____ or _____.
    a. Task, application, BoT, DAG, workflow

b. Job, application, Bag of Task, workflow, directed cyclic graph
c. Job, application, Bin of Task, wireframe, directed cyclic graph
d. Job, application, Bag of Task, workflow, directed acyclic graph
e. Task, application, Bag of Task, wireframe, directed cyclic graph

11. Resource provisioning and task scheduling are used to acquire resources and scheduling tasks on virtual machines. Choose any two incorrect statements related to these concepts.
a. An application consists of multiple tasks so the relationship between the task and the application can be called as one-to-many relationship.
b. An application consists of multiple tasks so the relationship between the application and the task can be called as one-to-many relationship.
c. In the workflow diagram, we use a directed link to show the dependency of a child node on a parent node.
d. In a workflow diagram, we can have multiple entry as well as exit tasks.
e. If two tasks are running on the same resource, then the transfer time is considered as negligible.

12. As per the below image mark the incorrect option about the sharing of resources.



a. (C) shows Space-share for VMs and jobs
b. (D) shows space-share for VMs and time-share for jobs
c. (A) shows time-share for VMs and space-share for jobs
d. (B) shows Space-share for VMs and jobs
e. (B) shows Time-share for VMs and jobs

Solution: (B) shows space time share of VMs and jobs

13. By default, the local or on-premises instance cannot be communicated to the Internet. AWS _____ can be used to securely connect customer's on-premises or site data to the VPC on AWS platform using a private communication link. One end of the private link is connected to _____ while the other end of the private link is connected to _____. _____ allows a virtual private gateway to connect with multiple customer gateways. (Mark two options)

    a. Direct Connect, customer gateway, virtual private gateway, AWS VPN CloudHub
    b. Site to site VPN, customer gateway, virtual private gateway, AWS VPN CloudHub
    c. Site to site VPN, virtual private gateway, customer gateway, AWS VPN CloudHub
    d. Direct Connect, customer gateway, virtual private gateway, Transit gateway
    e. Site to site VPN, NAT gateway, Internet gateway, AWS Direct Connect

14. Choose the correct statement/s about horizontal and vertical scaling.
    a. Vertical scaling increases availability than horizontal scaling.
    b. Horizontal scaling offers redundancy in comparison to having only one system in vertical scaling.
    c. Horizontal scaling does not need additional infrastructure.
    d. We can extend vertical scaling up to some extent, but it has limits.
    e. None of these

15. Mr. Hariharan developed an application and tested it on his PC. Now, he wanted to test for fault tolerant capability of his application for large volume of workload. So, he requested for the EC2 instance having unused and spare computing capacity on AWS cloud platform. Amazon EC2 agreed to provide _____ EC2 instance in substantial cost till the time AWS receives any specific capacity requirements for those instances from the users. Initially, he was not sure about the workload of the application, so he opted for _____ EC2 instance. After some time, he found that the load on his application is consistent so, he opted for _____ EC2 instance for 2-year duration of time. Later, he applied some _____ also for the selection of EC2 instance to minimize the cost of the EC2 instance.
    a. On-demand, spot, scheduled, saving plans
    b. Spot, on-demand, reserve, saving plans
    c. Spot, on-demand, scheduled, cost cutting plans
    d. On-demand, scheduled, spot, cost cutting plans

16. What does XXX and YYY means in Bucket path-style URL endpoint: https://s3.XXX.amazonaws.com/bucket-name and bucket virtual hosted-style URL endpoint: https://YYY.s3-ap-northeast-1.amazonaws.com.
    a. Region Code, Region Code
    b. Bucket Name, Bucket Name
    c. Bucket Name, Region Code
    d. Region Code, Bucket Name

Section III (Hard) (5X4=20 Marks)

1. A small and medium enterprise (SME) needs IT resources for the new project. SME has two options to satisfy the requirements, which are given as follows.

Expenditure	On Premises	Cloud (Cost/Hour)
❖ Servers Purchase Cost	$ 60,000	$ 4
❖ Network	$ 65,000	$ 3
❖ Storage	$ 75,000	$ 4
❖ Power and cooling	$ 3 /hour	-
❖ Management Cost	$ 2 /hour	$ 1

Calculate the cost in both cases and select the most suitable option for the project.

a. Choose cloud if the project duration is <=1 year
b. Choose cloud if the project duration is <= 2 year
c. Choose cloud if the project duration is <= 3 year
d. Choose cloud if the project duration is <=4 year

Solution: Select the best suitable answer:

	On-premises	Cloud
1st	$ 243800	$ 105120
2nd	$ 287600	$ 210240
3rd	$ 331400	$ 315360
4th	$ 375200	$ 420480

Option C is correct.

2. Consider a scenario where a SME (small and medium enterprise) wants to use a cloud service from Google. Following points are included in Service level agreement (SLA) before the service orchestration.

   ❖ Availability guarantee: 99.9% time over the service period

   ❖ Service period: (1 Jan 2016 to 31 Dec 2019)

   ❖ Maximum service hours per day: 8 hours

   ❖ Cost: INR 1200 per day

   Service credits are awarded to customers if availability guarantees are not satisfied.

   ❖ Monthly connectivity uptime service level are given as follows.

   ❖ Monthly uptime percentage < 99.9%, Service credit: 10%

   ❖ Monthly uptime percentage < 99%, Service credit: 15%

   ❖ Monthly uptime percentage < 90%, Service credit: 50%.

   However, in reality, it was found that over the service period, the cloud service suffered ten outages of durations: 60 mins, 2 hour 40 mins, 1200 seconds, 20 mins, 1 hour 40 min, 2 hour, 360 min, 60 min, 70 min, and 1 hour 50 min each on different days, due to which normal service guarantees were violated. If SLA negotiations are honored, compute the effective cost payable towards buying the cloud service

a. > INR 15 lakh
b. < INR 15 Lakh
c. = INR15 Lakh
d. None

Solution:

Outage time = 1080 minutes
Service time = (3 * 365 + 1 * 366) * 8 * 60 = 701280 minutes
Effective service time = (701280 – 1080) minutes = 700200 minutes
% availability = 700200/ 701280 = 99.84 % (10% service credit will be awarded)
Effective cost to pay = (1461 * 1200) – (1461 * 1200 * 0.10)
= 15.77880 Lakh > INR 15 Lakh

3. Consider a set of two VM resources with processing speed 100 MIPS and 200 MIPS, and related bandwidth 10 Mbps and 5 Mbps, respectively. Consider a set of 4 tasks with volume in instructions (in MI) 200, 400, 100 and 300, and volume of data (in Mb) 20, 30, 10, and 40, respectively. Find the expected time to compute (ETC) matrix. Specify the matrix type as consistent, semi-consistent and inconsistent. Mark the Correct Option.

	R1	R2
T1	8	5
T2	7	8
T3	9	2.5
t4	7	9.5

(A)

	R1	R2
T1	4	5
T2	7	10
T3	11	2.5
t4	7	9.5

(B)

	R1	R2
T1	4	5
T2	7	8
T3	2	2.5
t4	7	9.5

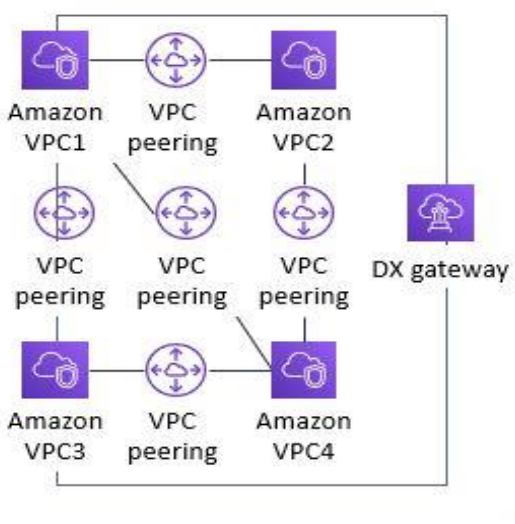
(C)

	R1	R2
T1	4	5
T2	7	10
T3	2	5
t4	7	9.5

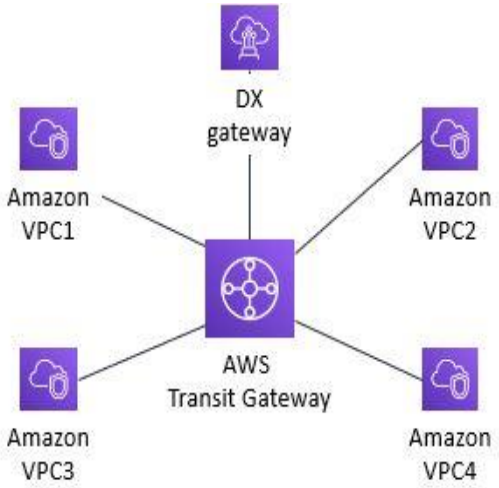
(D)

a. A as Consistent
b. C as inconsistent
c. B as consistent
d. C as consistent
e. D as consistent

4. Choose the incorrect statements about the following figures.



(a) VPC peering



(b) Transit gateway connection

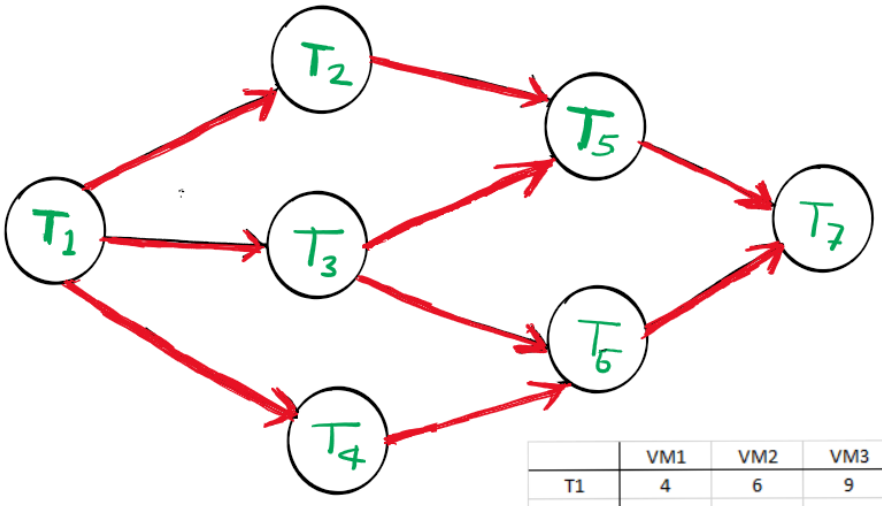
a. According to the given figure (a), Amazon VPC2 can communicate to Amazon VPC3.
b. According to the given figure (b), Amazon VPC2 can indirectly communicate to Amazon VPC3.
c. Total number of entries in the routing table of VPC1 is 5 and 2 in figure (a) and (b), respectively.
d. Total number of entries in the routing table of VPC4 is 3 and 2 in figure (a) and (b), respectively.
e. Total number of entries in the routing table of VPC2 is 3 and 2 in figure (a) and (b), respectively.

Solution:

In the routing table of VPCs, we need to make as many entries as the number of direct connections with other VPC or with some other service. Apart from that, we need to make one more entry for internal connection within the VPC.

In the transit gateway, each VPC routing table contains two entries, one for internal connection and one with the transit gateway.

5. As per the given DAG of 7 tasks and available set of 3 VMs, the scheduling of all the tasks needs to be done using SJF (shortest job first). Then mark the correct options. (Select 3 options)



Fig(A): DAG

ETC =

	VM1	VM2	VM3
T1	4	6	9
T2	3	9	8
T3	10	8	9
T4	8	8	7
T5	11	7	9
T6	6	8	10
T7	7	5	9

a. As per the given (SJF) scheduling scheme, the makespan is 42 time-unit and average VM utilization is 55.6%

b. As per the given (SJF) scheduling scheme, the makespan is 24 time-unit and average VM utilization is 55.6%

c. As per the given (SJF) scheduling scheme, the utilization of VM1 and VM3 is 54.20% and 29.2% respectively

d. As per the given (SJF) scheduling scheme, VM1 and VM2 are having equal number of tasks but utilization of VM2 is more than utilization of VM1

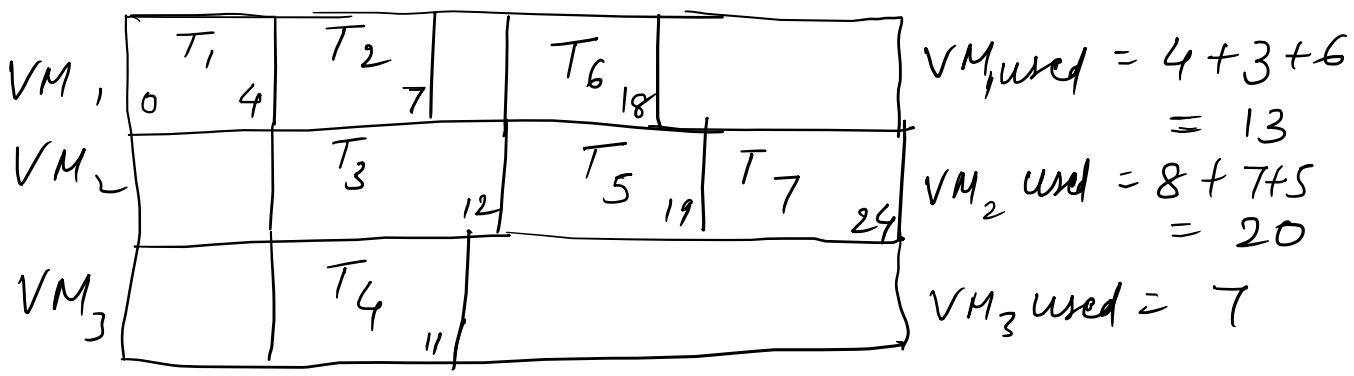
e. As per the given (SJF) scheduling scheme, VM3 and VM2 are having equal number of tasks and utilization of VM3 is lesser than utilization of VM1

f. As per the given (SJF) scheduling scheme, the makespan is 28 time-unit and average VM utilization is 65.6%.

Solution: VM selection based on SJF scheduling scheme

	VM1	VM2	VM3
T1	4		
T2	3		
T3		8	
T4			7
T5		7	
T6	6		
T7		5	

Gantt chart



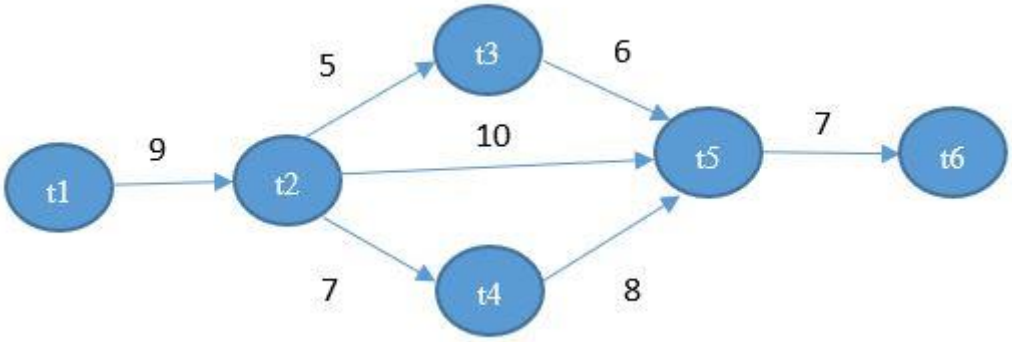
% VM1 utilization: 13/24 = 54.2% (approx.)

% VM2 utilization = 20/24 = 83.3% (approx.)

% VM3 utilization = 7/24 = 29.2 % (approx..)

Average VM utilization = (54.2+83.3+29.2)/3 = 55.6 % (approx.)

6. Consider the following DAG and ETC matrix and calculate B-level score of each task and order of execution of the tasks through B-Level priority assignment scheme.



VMs	Tasks					
	t1	t2	t3	t4	t5	t6
VM1	9	5	6	7	5	11
VM2	7	6	4	8	11	12
VM3	6	10	5	10	10	10
VM4	8	11	8	9	8	11

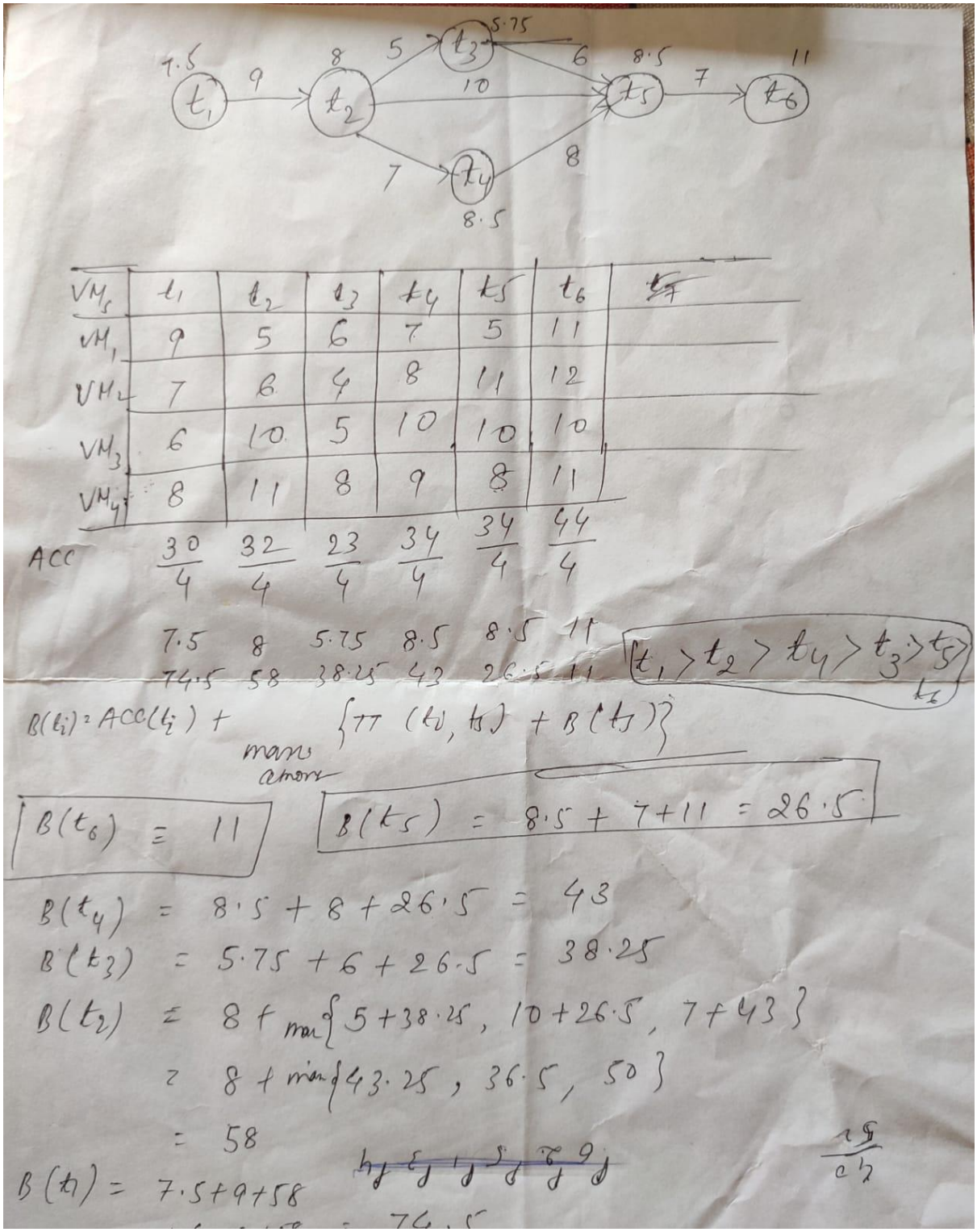
a. B-level scores:
   B(t1) = 79.5, B(t2) = 38.45, B(t3) = 32.25, B(t4) = 45, B(t5) = 27, B(t6) = 15
   Priority order : t1, t2, t3, t4, t5, t6.

b. B-level scores:
   B(t1) = 74.5, B(t2) = 58, B(t3) = 38.25, B(t4) = 43, B(t5) = 26.5, B(t6) = 11
   Priority order : t1, t2, t4, t3, t5, t6.

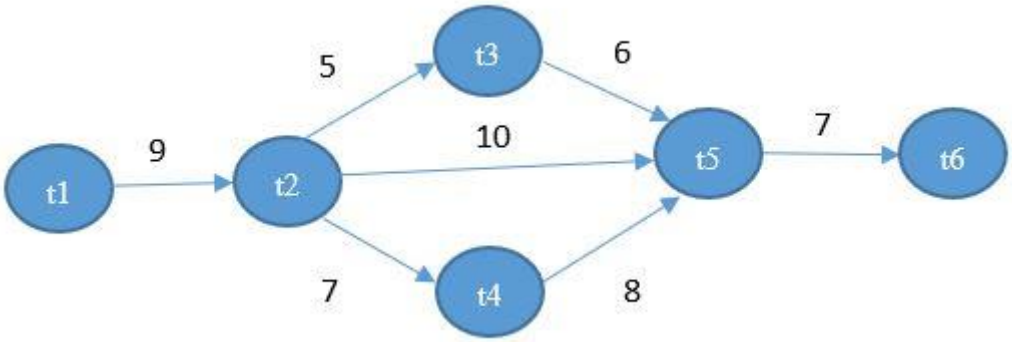
c. B-level scores:
   B(t1) = 11, B(t2) =26.5, B(t3) = 43, B(t4) =38.25, B(t5) = 58, B(t6) = 74.5
   Priority order : t6, t5, t3, t4, t2, t1.

d. B-level scores:
   B(t1) = 64.5, B(t2) = 58, B(t3) = 28.25, B(t4) = 33, B(t5) = 26.5, B(t6) = 11
   Priority order : t6, t5, t3, t2, t4, t1.

e. None of these



7. Consider the following DAG and ETC matrix and calculate T-level score of each task and order of execution of the tasks through T-Level priority assignment scheme.



VMs	Tasks					
	t1	t2	t3	t4	t5	t6
VM1	9	5	6	7	5	11
VM2	7	6	4	8	11	12
VM3	6	10	5	10	10	10
VM4	8	11	8	9	8	11

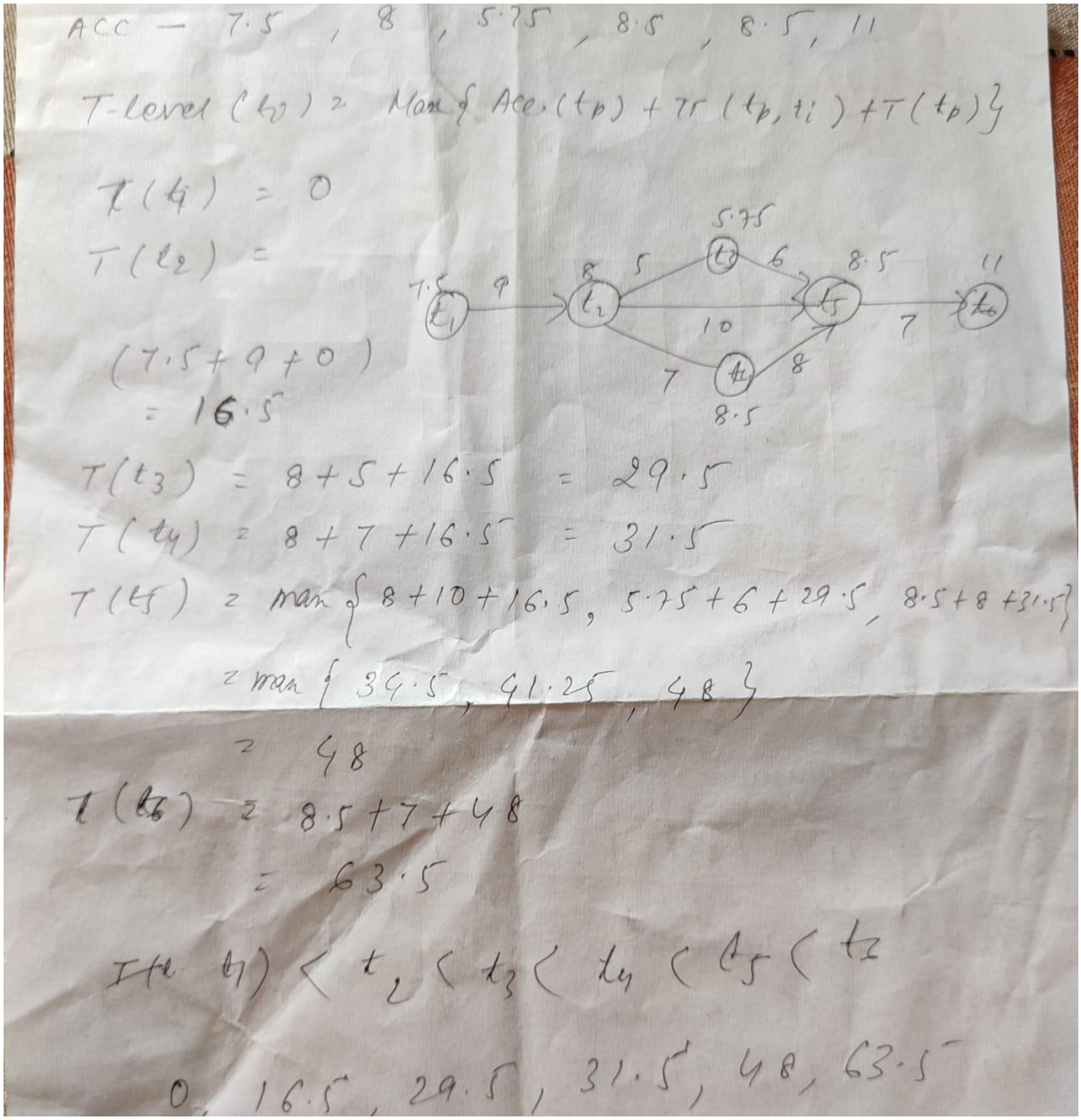
a. T-level scores:
T(t1) = 7.5, T(t2) = 11.5, T(t3) = 26.5, T(t4) = 32.5, T(t5) = 45, T(t6) = 53.5
Priority order : t6, t5, t3, t4, t2, t1.

b. T-level scores:
T(t1) = 0, T(t2) = 16.5, T(t3) = 29.5, T(t4) = 31.5, T(t5) = 48, T(t6) = 63.5
Priority order : t1, t2, t3, t4, t5, t6.

c. T-level scores:
T(t1) = 0, T(t2) = 8.5, T(t3) = 29.5, T(t4) = 21.5, T(t5) = 58, T(t6) = 73.5
Priority order : t1, t2, t3, t4, t5, t6.

d. T-level scores:
T(t1) = 7.5, T(t2) = 12.75, T(t3) = 39.5, T(t4) = 42.5, T(t5) = 48, T(t6) = 35.5
Priority order : t6, t5, t4, t3, t2, t1.

e. None of these



If any Query and doubt, please reach out to your Lecture Instructor of ECSE304L.