Register number _____

SRM Institute of Science and Technology
College of Engineering and Technology
School of Computing
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu
Academic Year: 2023-24 (EVEN)
B.Tech-Computer Science & Engineering **SET – B-Answer Key**

Test: CLA-T3 **Date: 03.05.2024**
Course Code & Title: 18CSE419T & GPU Programming **Duration: 2 periods**
Year & Sem: III Year /VI Sem **Max. Marks: 50**

Course articulation matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3														3
CO-2		3	2												3
CO-3		3	3												3
CO-4		3	3												3
CO-5			3	1									2		3

Part – A(1*10=10 Marks)
Answer All the Questions

Q. No	Questions	Marks	BL	CO	PO	PI Code
1	Which data clause of OpenACC allocates memory on GPU and copies data from host to GPU when entering region? a) Copy(int) **b) Copyin(list)** c) Copyout(list) d) Create(list)	1	1	CO 4	2	**2.2.1**
2	The ASYNC clause allows us to run some operations a) Parallely b) Synchronously **c) Concurrently** d) One after another	1	1	CO 4	2	**2.2.1**
3	When using the kernels directive in OpenACC, **a) The auto clause is implied** b) The independent clause is implied c) The dependent clause is implied d) The seq clause is implied	1	1	CO 4	2	**2.2.1**
4	The clause firstprivate is like private except that a) The private clauses are initialized to the same value used on the device b) The private clauses are initialized to the default values **c) The private clauses are initialized to the same value used on the host** d) The private clauses are uninitialized	1	1	CO 4	2	**2.2.1**
5	When parallelizing our loops the highest level of parallelism is **a) Gang level parallelism** b) Worker level parallelism c) Vector level parallelism d) warp level parallelism	1	1	CO 4	2	**2.2.1**
6	Data must be visible on the _____ when we run our parallel code a) host **b) device** c) host and device d) memory	1	1	CO 5	3	**3.2.1**

Register number _____

7	Which one is not an unstructured data clause? **a) Copy(list)** b) Copyin(list) c) Copyout(list) d) Create(list)	1	1	CO 5	3	**3.2.1**
8	The _____ directive informs the compiler to parallelize the iterations of the next loop a) Parallel **b) Loop** c) Kernel d) gang	1	1	CO 5	3	**3.2.1**
9	Programming in which two or more unrelated operations can occur independently or even at the same time without immediate synchronization is a) Synchronous programming **b) Asynchronous programming** c) GPU programming d) High-level programming	1	1	CO 5	3	**3.2.1**
10	Which of the following is an unstructured data directive? a) Data directive **b) Enter data directive** c) Kernel directive d) Exit parallel directive	1	1	CO 5	3	**3.2.1**

Part – B (4*4=16 marks)
Answer any four Questions

Q. No	Question	Marks	BL	CO	PO	PI Code
11	Differentiate parallel and kernel directives in OpenACC. • The parallel directive instructs the compiler to create parallel *gangs* on the accelerator • Gangs are independent groups of worker threads on the accelerator • The code contained within a parallel directive is executed redundantly by all parallel gangs • The kernels directive instructs the compiler to search for parallel loops in the code • The compiler will analyze the loops and parallelize those it finds safe and profitable to do so • The kernels directive can be applied to regions containing multiple loop nests	4	2	CO4	2 & 3	**2.2.1**
12	What is asynchronous programming in OpenACC?.What is the clause used to implement the same and how?	4	3	CO5	3	**2.2.1**
13	How auto clause and independent clause are used to implement parallelism in OpenACC? • The **auto** clause tells the compiler to decide whether or not the loop is parallelizable • The auto clause can be very useful when you are unsure of whether or not a loop is safe to parallelize	4	3	CO4	2 & 3	**2.2.1**

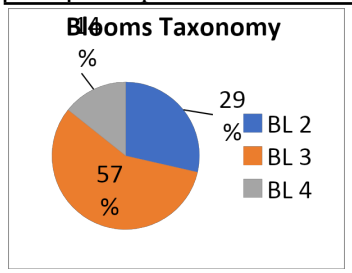
Register number _____

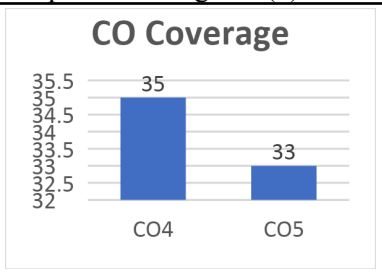
	• The **independent** clause asserts to the compiler that the loop is parallelizable • This will overwrite any decision that the compiler makes about the loop • Adding the independent clause could force the compiler to parallelize a non-parallel loop • Allows the programmer to force parallelism when using the kernels directive Refer ppt for code and notes					
14	What are private and firstprivate variables in OpenACC? • The **private** clause allows the programmer to define a list of variables as "thread-private". • Each thread will be given a private copy of every variable in the comma-separated list • **firstprivate** is like private except that the private values are initialized to the same value used on the host. **private** variables are uninitialized. • Variables in **private** or **firstprivate** clause are private to the loop level on which the clause appears. • Private variables on an outer loop are shared within inner loops. • The **private** clause allows the programmer to define a list of variables as "thread-private". • Each thread will be given a private copy of every variable in the comma-separated list • **firstprivate** is like private except that the private values are initialized to the same value used on the host. **private** variables are uninitialized. **Refer ppt for code**	4	3	CO5	3	**2.2.1**
15	What are vectors in OpenACC? Illustrate with code.	4	3	CO5	3	**2.2.1**
	Part – C (2*12=24 marks) **Answer any Two Questions**					

16	Apply Gang and worker level parallelism to parallelize the loop in order to optimize it.(12)
	Refer PPT
	`#pragma acc kernels loop gang worker(1)`
	`for(int x = 0; x < 4; x++){`
	`  #pragma acc loop vector(8)`
	`  for(int y = 0; y < 8; y++){`
	`  array[x][y]++;`
	`  }`
	`}`
	• The diagram shows a single gang, though the compiler will be able to generate as many gangs as it wants
	• These gangs are completely separate from each other, and are indistinguishable
		12	3	CO5	3	**2.2.1**

Register number _____

	• We will show these gangs apply to a physical loop diagram, but this representation may not be 100% accurate to what the compiler might decide					
17	List any three directives of OpenACC and illustrate the same with the code segment.(12)	12	3	CO4	2 & 3	**2.2.1**
18	Illustrate how collapse clause is used to combine multiple parallel loops into a single loop.(6) Compare and Contrast explicit and implicit data regions.(6)	12	3	CO4	2 &3	**2.2.1**





Approved by Audit Professor/ Course Coordinator

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