

Name Rahi

Enrollment No. 3145

Jaypee Institute of Information Technology, Noida
End Term Examination, ODD Sem 2023-24
B. Tech V Semester

Course Title: Computer Organisation and Architecture
Course Code: 15B11CI313

Maximum Time: 2 hrs
Maximum Marks: 35

After completion of this course, students will be able to

C213.1	Summarize and classify the different computer systems based on RISC and CISC architecture	Understand (Level 2)
C213.2	Apply the knowledge of performance metrics to find the performance of systems.	Apply (Level 3)
C213.3	Examining various types of computers based on Instruction Set architecture	Apply (Level 3)
C213.4	Analyze RISC and CISC based system design for Hardwired and Microprogrammed Controller	Analyse (Level 4)
C213.5	Apply the knowledge of pipeline, IO and cache to understand these systems. Further analyze the performance of such systems.	Analyse (Level 4)
C213.6	Create and analyse an assembly language program of RISC and CISC- based systems.	Evaluate (Level 5)

Important Instruction: Attempt all questions.

Q1) [C213.2] [3 marks] Find average CPI and performance (in million instructions per second) for a system with given specifications. The clock rate is 2 GHz. Also find the execution time for 1350 instructions.

S. No.	Instruction category	Occurrence (In %)	Cycle of Instruction
1	ALU	40	2
2	Load and Store	15	3
3	Branch	35	4
4	Other	10	5

Q2) [C213.2] [3 marks] Consider a program with a total execution time of 100 seconds on a single – core processor. After careful analysis, it is determined that 90% of the program can be parallelized, while the remaining 10% must be executed serially. Calculate the speed up for 16 processors. Determine the maximum speed up that can be achieved.

Q3) [C213.5] [3 +2 marks] Consider a pipelined processor with four stages: IF, ID, EX and WB. Suppose IF, ID and WB are taking one clock cycle to complete. The number of clock cycles for EX depends on the instruction. ADD and SUB takes 1 clock cycle whereas MUL and DIV needs 3 clock cycles in the EX Stage. Determine the number of clock cycles taken to complete the following sequence of instructions

- With Operand Forwarding
- Without Operand Forwarding

Sequence of Instructions:

ADD R2, R1, R0	$R2 \leftarrow R1 + R0$
DIV R6, R3, R5	$R6 \leftarrow R3 / R5$
MUL R4, R3, R2	$R4 \leftarrow R3 * R2$
SUB R6, R5, R4	$R6 \leftarrow R5 - R4$

Q4) [C213.5] [2 marks] A CPU has a five-stage pipeline and runs at 1 MHz frequency. Instruction fetch happens in the first stage of the pipeline. A conditional branch instruction computes the target address and evaluates the condition in the 4th stage of the pipeline. The processor stops fetching new instructions following a conditional branch until the branch outcome is known. A program executes 10^6 instructions out of which 30% are conditional branches. If each instruction takes one cycle to complete on an average, what will be the total execution time of the program?

Q5) [C213.5] [3+1+2 marks] Consider a 2-way set associative cache with LRU replacement. The cache is [P.T.O]

of 8 bytes and byte-addressable main memory has 256 blocks with each block of 1 byte. Consider a conflict miss as the number of times a block has to be replaced to accommodate another block in cache. The following sequence is followed for accessing blocks in terms of block numbers:

128, 93, 94, 95, 96, 97, 93, 99, 98, 93, 94, 96, 97, 99, 92, 93, 94, 99, 26, 27, 28, 92, 94, 99, 29, 30

a) What is the hit ratio?

b) What is the number of conflict miss?

c) If the cache access time is 4ns and memory access time is 100ns, then find the effective average access time.

Q6) [C213.5] [2+1 marks] Consider a 32-bit processor with a 4-way write back set associative 256KB cache. The block size in byte addressable main memory is 32 bytes and a tag directory containing tag address, 1 replacement bit and 2 valid bits (for each tag address) is there. A tag directory is maintained that stores all the tags that are present in the size and therefore its size depends on the number of lines in cache and size of each tag.

a) Calculate the number of bits required for tag address?

b) Calculate the size of cache tag directory?

Q7) Suppose the branch is taken in the following instruction sequence, and PC relative addressing mode is used.

a) **[C213.6] [2 marks]** Show the calculations for the target address of the branch instruction and what will be the target address?

b) **[C213.6] [1 mark]** Which instruction will execute after the branch instruction?

c) **[C213.1] [2 marks]** Determine the addressing mode used in each of the following instruction.

```

0996: la $a0, str2
1000: li $a1, 5
1004: li $v0, 4
1008: la $a0, str1
1012: li $a1, 5
1016: li $v0, 4
1020: sub $t0, $4, $8
1024: beq $1, $3, -7
1028: and $t2, $2, $5
1032: or $t3, $2, $6
1036: add $t4, $4, $2
1040: slt $t5, $6, $7
1044: jal 1020
...
1056: lw $4, 50($7)

```

Q8) [C213.5] [4+2 marks] Suppose we add modulo instructions in the pipelined processor. The operation times are as follows:

- A. Instruction memory access time = 300 ns
- B. Data memory access time = 300 ns
- C. ALU delay for basic instructions = 190ps
- D. ALU delay for modulo instructions = 500ps
- E. Register file read access time = 150 ps
- F. Register file write access time = 150 ps.

Ignore the other delays in the multiplexers, control unit, sign extension etc.

a) What is the total delay for each instruction class and the maximum clock cycle for single cycle CPU design? Also specify the instruction corresponding to maximum clock cycle.

b) As we know the unconditional jump instruction in MIPS has address boundary of 2^{26} instructions. If the starting address is 0x2000 000, what will be the last valid address to avoid segmentation fault and first invalid address?

Q9) [C213.4] [2 marks] Consider the following hybrid instruction for a MIPS processor:

add \$s0, \$s1, 10 (\$s3)

Design a single cycle data path for the above instruction.

POSSESSION OF MOBILES IN EXAM UFM PRACTICE:

Name.....Rabi.....

Enrollment No.....3145.....

Jaypee Institute of Information Technology, Noida

End Semester Examination, ODD Sem.2023

B.Tech 5th Semester

Course Title: Object Oriented Analysis and Design using JAVA

Maximum Time: 02 Hr

Course Code: 20B12CS334

Maximum Marks: 35

C333-1.1	Explain Object oriented analysis and design principles
C333-1.2	Analyze requirements to identify use cases, classes, and objects
C333-1.3	Create UML diagram for structural and behavioral modeling
C333-1.4	Design and implement software solutions using object-oriented analysis and design
C333-1.5	Evaluate software design complexity using metrics

Note: Attempt all questions

Case study:

In the realm of software development, the online library management system emerges as a cutting-edge solution designed to modernize the library operations in the digital age. During the object-oriented analysis phase key classes were identified as the backbone of the system: 'Book', 'Member', 'Librarian', 'Transaction', and 'Category' with following details:

Class	Attributes	Methods
Book	title: String author: String availability: boolean bookID: int	addBook(title:String, author:String, availability:boolean):void removeBook(bookID:int):void updateAvailability(bookID:int, newAvailability:boolean):void
Member	name: String contact:String borrowingHistory: Transaction [] fines: double memberID:int	borrowBook(bookID:int):void returnBook(bookID:int):void payFines(amount:double):void
Librarian	adminID:int booksInInventory: Book[] memberList: Member[]	addBookToInventory (title: String, author: String):void manageMember(memberID:int, action: String): void notifyOverdueMembers():void
Transaction	transactionID:int borrowDate:Date returnDate:Date member:Member book:Book	recordBorrowTransaction(memberID:int, bookID):void recordReturnTransaction(memberID:int, bookID:int):void
Category	categoryName: String booksIncategory: Book[]	addBookToCategory(bookID:int, category:String): void removeBookFromcategory(bookID:int, Category:String): Void

Relationships were established, such as the association between 'Member' and 'Transaction' for borrowing and returning transactions, and the aggregation between 'Book' and 'Category' for Systematic book organization, inheritance relationships were introduced with 'FictionBook' and 'NonFictionBook' inheriting from the 'Book' class.

Based on above case study answer the following questions:

Q1. [C333-1.3, Apply Level, 4 Marks] Design a class diagram with all the details provided in the above case study.

Q2. [C333-1.5, Evaluate Level, 8 Marks] Explain the following quality metrics and calculate these values for the class diagram designed in Q1.

- a. Coupling between objects (CBO) for each class
- b. Lack of cohesion in methods (LCOM) for Book class with following variable instruction sets
I1={title, author, availability, bookID}; I2={bookID}; I3={title, BookID}; I4={author}
- c. Method Inheritance Factor
- d. Attribute Inheritance Factor

Q3. [C333-1.4, Apply Level, 10 Marks] Write the JAVA code to implement the relationships provided in above case study.

Q4. [C333-1.1, Understanding Level, 5 Marks]

- a) The 'FictionBook' class introduces a new method called calculatePopularityScore(). Discuss the potential implication for Liskov substitution when using this method with a generic 'Book' reference. How might you address this while preserving substitutability?
- b) A new requirement arises to provide a detailed audit trail of all book-related transactions. How can you ensure to implement unnecessary methods, adhering to the Interface Segregation Principle?

Q5. [C333-1.3, Apply Level, 8 Marks] Draw the sequence and activity diagrams for above case study.

POSSESSION OF MOBILES IN EXAM IS UFM PRACTICE

Name Rahi

Enrollment No. 3146

Jaypee Institute of Information Technology, Noida
End Term Examination, 2023

B.Tech, V Semester

Course Title: Laser Technology and Applications
Course Code: 16B1NPH533

Maximum Time: 2 Hrs
Maximum Marks: 35

CO1	Defining the properties and principle of lasers
CO2	Understanding of various applications of lasers
CO3	Ability to apply the concepts of standard techniques for the pulsed operation of laser and stability of laser resonator
CO4	Analysis of types of lasers

Note: Attempt all the questions

Q.1:(a) Why gas lasers emit light, which is more unidirectional and monochromatic as compared to that of solid-state lasers? Write the chemical formula of YAG and Sapphire.

(b) Write the full name of LASIK, LIGO, LAGEOS and LIDAR.

[CO2 (Understanding), 3+2 Marks]

Q.2: Draw the energy level diagram of CO₂ laser by showing its two prominent wavelengths. Write which mode of energy is represented by (0 0 1). Also, write the roles of N₂ and He gases in this laser.

[CO2 (Understanding), 5 Marks]

Q.3: Mention the name of active material of dye laser. Draw the energy level diagram of dye laser and show the emission wavelength(s).

[CO2 (Understanding), 5 Marks]

Q.4: (a) Write the formula of bandgap of Al_xGa_{1-x}As. Determine the bandgaps and emission wavelengths for AlAs and GaAs laser diodes.

(b) The two energy levels are separated by a certain energy difference, such that the corresponding transition wavelength falls in the middle of the visible range. Calculate the ratio of the populations of the excited level to ground level in thermal equilibrium at room temperature.

[CO3 (Applying), 3+2 Marks]

Q.5: (a) Show the neat and clean ray diagram of bar code scanner.

(b) Write the two important differences between Q-switching and mode locking of a laser.

[CO4 (Analyzing), 3+2 Marks]

Q.6: (a) Write the emission wavelengths of argon ion and krypton ion lasers and justify, why lasers based on the mixture of these ion gases are used for multicolor displays?

(b) Write the role of de-Broglie wavelength in quantum well lasers.

[CO4 (Analyzing), 3+2 Marks]

Q.7: Write the condition of converging and diverging beam in a resonator. Consider a resonator made of two mirrors ($R_1 > 0$, $R_2 > 0$), separated by a distance L . Find all possible values of L for which the resonator is stable.

[CO4 (Analyzing), 5 Marks]

POSSESSION OF MOBILES IN EXAM IS UFM PRACTICE.

Name Rahi

Enrollment No. 2145

Jaypee Institute of Information Technology, Noida

End Term Examination, 2023

B. Tech, Semester-V

Course Title: Positive Psychology
Course Code: 16B1NHS432

Maximum Time: 2 Hour
Maximum Marks: 35

CO1	Demonstrate an understanding of the various perspectives of positive psychology and apply them in day to day life.
CO2	Examine various theories and models of happiness, well-being and mental health.
CO3	Recommend possible solutions for enhancing happiness, wellbeing and mental health.
CO4	Evaluate interventions/strategies for overall positive functioning.

Note: Attempt all the questions

- Q1. The movie "Tare Zameen Par" explores the life and imagination of [CO2 (Analyse) Ishaan, an artistically gifted 9-year-old boy whose poor academic 4 marks] performance leads his parents to send him to a boarding school, where a new art teacher Nikumbh suspects that he is dyslexic and helps him to overcome his reading disorder. Analyse the statement in terms of importance of teacher's behaviour in shaping the future of students.
- Q2. The life stories of famous cricketers like Rohit Sharma and Virat [CO4 (Evaluate) Kohli are live examples of those who were committed to 6 marks] recognizing and building on their strengths rather than giving up to hardships in life. In light of the given statement evaluate positive youth development and the attainment of nine positive outcomes that are targeted by positive programmes.
- Q3. It is often observed in day-to-day life that merely saying "me" or [CO1 (Apply) "we" changes our psychological response and the response of other 4marks] people. Explain the application of psychology of Me and We.

- Q4. George Vaillant was of the view that we need to have and continue to find meaning throughout our lives. On the basis of the statement analyse the task of adulthood development propagated by him. [CO2 (Analyse) 5marks]
- Q5. Critically evaluate the primary prevention approach of mental health. [CO4 (Evaluate) 3marks]
- Q6. Evaluate how Wisdom Strength from Values in Action Inventory contribute in enhancing well-being. [CO3 (Evaluate) 4marks]
- Q7. Read the following: [CO1 (Apply) 3marks]
1. You listen to other worker's input and concerns and respond appropriately.
 2. You are good at encouraging an unwilling colleague to express themselves
 3. You know when to press on and when to back down when conflicts arise.
- The above statements are part of the feedback that a manager has identified for one of his employees. On the basis of above feedback explain the application of Clifton's strengths-based approach to gainful employment in organizations.
- Q8. Evaluate the behaviours that are important to develop and sustain relations by using the framework given by Harvey and Omrazu. [CO4 (Evaluate) 3marks]
- Q9. Examine the dark side of being a workaholic. [CO2 (Analyse) 3marks]

POSSESSION OF MOBILES IN EXAM IS UFM PRACTICE.

Name Rahi

Enrollment No. 3145

Jaypee Institute of Information Technology, Noida
End Term Examination, ODD Sem 2023
B. Tech. V Semester

Course Title: Operating Systems and Systems Programming
Course Code: 15B11CI412

Maximum Time: 2 hrs
Maximum Marks: 35

COURSE OUTCOME		CONGNITIVE LEVEL
C311.1	Explain the fundamental concepts along with the various components of operating systems and systems programming.	Remember Level
C311.2	Apply various OS scheduling techniques and algorithms for process and threads.	Apply Level
C311.3	Elaborate the various resource management techniques of OS and their performance.	Evaluate Level
C311.4	Omit the concept of IPC and describe various process synchronization techniques in OS	Understand Level
C311.5	Compare various disk scheduling algorithms and utilize IO management techniques.	Apply Level
C311.6	Analyze the appropriate OS design when building real world systems.	Analyze Level

Note: Attempt All the questions.

Q1. [CO1, Remember Level, 5 Marks] Describe the following in context of operating system

- How the multiprogramming systems are different from real-time systems?
- Identify the evaluation matrices for process scheduling in a multiprogramming system environment.
- What factors are considered when deciding which process need to execute next?

Q2. [CO6, Analyze Level, 5 Marks] In operating system, the source code passes through following system tools before entering execution phase in memory pre-processor, compiler, assembler, linker, and loader. Suppose if linker is not present on system. Is it possible to the code enters execution phase in memory? Justify your statement with proper logic and explanation.

Q3. [CO3, Evaluate Level, 5 Marks] Analyze the given code for two processes and answer to the following questions:

- What is the output of the below code if both processes are executing concurrently?
- What are three conditions of synchronization; mutual execution, no progress, bounded waiting in below code?
- If not, what change is needed so that all three conditions are fulfilled?

Pseudo code:

```
Shared variable
int turn
int flag[2]={0,0}
```

```
Process P0
flag[0]=1
turn=1
while(flag[1]==1 && turn==0)
printf("I am Process P0");
flag[0]=0
```

```
Process P1
flag[1]=1
turn=0
while(flag[0]==1 && turn==0)
printf("I am Process P1");
flag[1]=0
```

Q4.[CO3, Evaluate Level, 5 Marks] A system has five process P₁ to P₅ and four resource types R₁ to R₄.

R₄. There are 2 units of each resource types. Given that:

P₁ holds 1 unit of R₁ and requests 1 unit of R₄

P₂ holds 1 unit of R₃ and requests 1 unit of R₂

P₃ holds 1 unit of R₂ and requests 1 unit of R₃

P₄ holds 1 unit of R₄ and requests 1 unit of R₄

P₅ holds 1 unit of R₃ and 1 unit of R₂ and requests 1 unit of R₃

a. Show the Resource Allocation Graph for this state of system

b. Is the system in deadlock? If so, which process and resources are involved?

Q5.[CO5, Apply Level, 5 Marks] Consider a disk with 2000 tracks numbered from 0 to 1999. The

current disk arm is at track 800. And the disk scheduling queue is as follows:

1500, 300, 1800, 500, 1900, 100, 1600, 1200, 900, 1400, 1100, 400, 1700, 600, 1300, 700, 300, 1800. The

arm moves towards the outermost track. Apply the SSTF, SCAN, C-LOOK to calculate the total number of track movements (seek operations) required to serve all the requests.

Q6.[CO5, Apply Level, 5 Marks] A UNIX style i-node has 15 direct pointers and one single, one double, and one triple indirect pointer. Disk block size is 16Kbytes, disk block address is of 64 bits. What is the total size of the file system and maximum possible file size?

Q7.[CO4, Understand Level, 5 Marks] Consider a system where segmentation is used. However, segment and segment table size, both are greater than PAS available. Therefore, paging is applied over segment and segment table both. Following is the description of the system:

The segment is divided into 4K pages each of size 1K words. The segment table is divided into 128K pages, each of size 256 words. The page table entry size is 64 bits. The frame number requires 18 bits to represent the frames of PAS. You need to find the following:

a. Size of physical address

b. Size of logical address

c. Page table size of segment

d. Page table size of segment table