राष्ट्रीय प्रौद्योगिकी संस्थान पटना
National Institute of Technology Patna
Mid-Semester Exam (Jan-Jun'24)
Session: 2023-24 Spring'24 Semester
Department: Computer Science and Engineering
Programme: BTech(CSE-I,II,III), BTech+DD(CSE-CS,DS)
Semester: 2nd
Course Code: **CS24108**
Course: Computer Organization
Full Marks: 30
Duration: 2 hours

[Attempt all questions; Answer concisely only in blue/black ink; Use pencil for artwork; Assume missing data; No mobile phones] [**No form of calculator is permitted**]
[Marks, Course Outcome and Bloom's Level are mentioned on right-hand side of each question]

Sl.		Questions	CO	BL
1.	a.	If the fixed-point binary representation of the decimal number 100.5_{dec} is 1100100.1_{bin}, then explain why the IEEE-754 single-precision floating-point representation of the same decimal number is $01000010110010010000000000000000_{bin}$ or $42C90000_{hex}$? **(6)** यदि दशमिक (दशमलव) नंबर 100.5_{dec} की फ़िक्स्ड-पॉइंट बाइनरी निरूपण 1100100.1_{bin} है, फ़िर व्याख्या करो कि IEEE-754 में वही दशमिक नंबर की सिंगल-प्रिसिशन फ़्लोटिंग-पॉइंट निरूपण $01000010110010010000000000000000_{bin}$ या $42C90000_{hex}$ क्यों हैं? [Course outcome(s) evaluated: CO-2(Understand/Explain)]	CO-2	Level-2
	b.	Write down the flowchart (or algorithmic steps) of addition of two given IEEE-754 floating-point numbers. **(4)** दो दिए गए IEEE-754 फ़्लोटिंग-पॉइंट नंबरों को जोड़ने का फ़्लोचार्ट (या एल्गोरिथम स्टेप्स) लिखो। [Course outcome(s) evaluated: CO-1(Remember/Recall)]	CO-1	Level-1
2.	a.	(i) What is the function of a control unit? **(2)** (ii) Define control signal and control word. **(1½+1½)** (iii) What are the different components of a control word in a microprogrammed control unit? **(2)** (i) एक कंट्रोल यूनिट का क्या कार्य है? (ii) कंट्रोल सिग्नल एवं कंट्रोल वॉर्ड की परिभाषा लिखो। (iii) माइक्रोप्रोग्राम्ड कंट्रोल यूनिट में कंट्रोल वॉर्ड के विभिन्न कॉम्पोनेंट्स (घटक) क्या हैं? [Course outcome(s) evaluated: CO-1(Remember/Recall)]	CO-1	Level-1
	b.	Consider that for certain instruction set architecture (ISA), a control unit of a processor (i.e., CPU) is required to generate 100_{dec} control signals, which can be divided into 4_{dec} groups of mutually-exclusive signals (i.e., one group independent of the other group) as follows: Group 1: 20_{dec} signals | Group 2: 50_{dec} signals Group 3: 20_{dec} signals | Group 4: 10_{dec} signals Consider that the control unit is designed as vertical microprogrammed control unit, in which encoded form of control signals (i.e., function codes) from each group are passed to a decoder for finally generating the actual control signals. Then explain why the control word size to be stored in this vertical microprogrammed unit is 20_{dec} bits? **(3)** मान लें कि कुछ इंस्ट्रक्शन सेट आर्किटेक्चर (ISA) के लिए एक प्रोसेसर (यानी, CPU) की कंट्रोल	CO-2	Level-2

Sl.		Questions	CO	BL
2.	b.	यूनिट को 100_{dec} कंट्रोल सिग्नल्स उत्पन्न करने की आवश्यकता होती हैं। वो कंट्रोल सिग्नल्स को परस्पर-विशिष्ट (यानी, पारस्परिक रूप से अनन्य) सिग्नल्स के 4_{dec} ग्रुप्स (समूहों) में श्रेणीबद्ध या अलग इस प्रकार किया जा सकता हैं, जहां एक ग्रुप दूसरे ग्रुप से स्वतंत्र है: ग्रुप 1: 20_{dec} सिग्नल्स | ग्रुप 2: 50_{dec} सिग्नल्स ग्रुप 3: 20_{dec} सिग्नल्स | ग्रुप 4: 10_{dec} सिग्नल्स मान लें कि कंट्रोल यूनिट को वर्टिकल माइक्रोप्रोग्राम्ड कंट्रोल यूनिट के रूप में डिज़ाइन किया गया है, जिसमें प्रत्येक ग्रुप की कंट्रोल सिग्नल्स के एन्कोडेड रूप (यानी, फ़ंक्शन कोड) से वास्तविक कंट्रोल सिग्नल्स को उत्पन्न करने के लिए आखिर में एक और डिकोडर के पास भेजा जाता हैं। फ़िर व्याख्या करो कि वर्टिकल माइक्रोप्रोग्राम्ड यूनिट में संग्रहीत किए जाने वाले कंट्रोल वॉर्ड का आकार 20_{dec} बिट्स क्यों हैं? [Course outcome(s) evaluated: CO-2(Understand/Explain)]	CO-2	Level-2
3.	a.	Consider a 16-bit processor that can execute the following instruction: Opcode of 'LOAD to AC' | Addressing mode Immediate/Displacement 0 7 8 15 The above instruction fulfils loading a value from the specified location into the accumulator AC. Let the above instruction is present in a 16-bit main memory at location 200_{dec}, as shown in the adjoining diagram. The 'mode' field specifies an addressing mode, and indicates a source register R1 appropriately, which stores the value 400_{dec}. There is also a base register that contains the value 100_{dec}. Assume that location 399_{dec} contains the value 999_{dec}, location 400_{dec} contains the value 1000_{dec}, and so on. Determine the effective address and the operand values to be loaded into AC for the following addressing modes: **(6)** (i) direct addressing mode; (ii) register indirect addressing mode; (iii) immediate addressing mode. 200_{dec}: LOADtoAC | mode 201_{dec}: 500_{dec} 399_{dec}: 999_{dec} 400_{dec}: 1000_{dec} 401_{dec}: 1001_{dec} मान लें एक 16-बिट प्रोसेसर जो उपरोक्त इंस्ट्रक्शन एक्सीक्यूट कर सकता हैं। उपरोक्त इंस्ट्रक्शन निर्दिष्ट स्थान से एक मान को एक्युमुलेटर AC में लोड कर सकता हैं। मान लें कि उपरोक्त इंस्ट्रक्शन 16-बिट मैन मेमोरी में स्थान 200_{dec} पर मौजूद हैं, जैसा कि संलग्न चित्र में दिखाया गया हैं। 'मोड' फ़ील्ड एक एड्रेसिंग मोड निर्दिष्ट करता हैं, और एक सॉर्स (स्रोत) रजिस्टर R1 को उचित रूप से इंगित करता हैं; मान 400_{dec} R1 में संग्रहीत हैं। एक बेस (आधार) रजिस्टर भी है जिसमें मान 100_{dec} हैं। मान लें कि स्थान 399_{dec} में मान 999_{dec} संग्रहीत हैं, स्थान 400_{dec} में मान 1000_{dec} हैं, इत्यादि। निम्नलिखित एड्रेसिंग मोड के लिए AC में लोड किए जाने वाले एफ़ेक्टिव एड्रेस और ऑपरेंड मानों को निर्धारित करें: (i) डिरेक्ट एड्रेसिंग मोड; (ii) रजिस्टर इंडिरेक्ट एड्रेसिंग मोड; (iii) इमीडियेट एड्रेसिंग मोड। [Course outcome(s) evaluated: CO-3(Apply/Solve)]	CO-3	Level-3
	b.	(i) Define instruction set. **(1)** (ii) Draw the instruction cycle state transition diagram, depicting all	CO-1	Level-1

Sl.		Questions	CO	BL
3.	b.	the steps required to execute an instruction. (3) (i) इंस्ट्रक्शन सेट की परिभाषा लिखों। (ii) इंस्ट्रक्शन साइकिल स्टेट (अवस्था) ट्रांज़ीशन (संक्रमण) की रेखाचित्र बनाओ, जिसमें किसी भी इंस्ट्रक्शन को एक्सीक्यूट करने के लिए आवश्यक सभी स्टेप्स को चित्रित करों। [Course outcome(s) evaluated: CO-1(Remember/Recall)]	CO-1	Level-1

List of Course Outcomes of "Computer Organization": After completing this course, a student should be able to —

CO-1. *recall* computer organization terminologies, as well as fundamental concepts, operating principles and methods about structures and functions of computer systems and their components;
[Bloom level: Remember; Mapped to: PO-1]

CO-2. *explain* concepts and techniques in functioning of arithmetic logic unit (ALU), floating-point unit (FPU), control unit (CU), instruction set architecture (ISA), memory hierarchy and input/output unit;
[Bloom level: Understand; Mapped to: PO-1, PO-2]

CO-3. *solve* problems on principles of arithmetic/logic functions, control mechanisms, cache, primary, secondary memory addressing, I/O addressing, instruction pipelining, as well as their performances;
[Bloom level: Apply; Mapped to: PO-1, PO-2, PO-3]

CO-4. *use* software tools for designing and evaluating microarchitecture in computer system for given ISA;
[Bloom level: Apply; Mapped to: PO-3, PO-5]

CO-5. *implement* assembly-language programs to fulfil program objectives in computer system for given ISA;
[Bloom level: Apply; Mapped to: PO-3, PO-5]

CO-6. *determine* pipeline hazards in computer system for given execution sequence.
[Bloom level: Analyze; Mapped to: PO-1, PO-2, PO-3]

---------- "BEST OF LUCK" ----------

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
Department of Humanities and Social Sciences
Ashok Rajpath, Patna-800 005

MID-SEMESTER EXAMINATION MARCH 2024

Course Name: Communicative English
Group: CSE (1,2 & 3)

Course Code: HS2410
Full Marks: 22.5
Time: 2 Hours

Instructions: **Answer all the questions in your own words.**

1. Identify and discuss three significant barriers in interpersonal communication. Provide examples on how they can be overcome in a professional setting. (7.5 marks) CO1

2. "Active listening is a key component of effective communication." With reference to this statement, describe the concept of active listening and its importance in professional and personal communication. Further, discuss three strategies to enhance active listening skills, providing examples of situations where these strategies can be applied. (7.5 marks) CO4

3. Prepare a precis of the passage given below. (7.5 marks) CO7

The digital revolution, a transformative period marked by rapid technological advancements, has significantly reshaped our daily lives, the way we work, and the manner in which we communicate. Originating in the late 20th century, this era continues to evolve, instigating sweeping changes in various facets of life. The onset of this epoch is rooted in the invention of the personal computer, which democratised computing power, followed by the launch of the World Wide Web in the early 1990s, a pivotal moment that shifted our reliance from traditional media to instant access to a diverse range of information. The emergence of smartphones has further revolutionised our communication methods, providing unparalleled connectivity.

In tandem with these technological advancements, social media platforms have emerged and evolved, profoundly redefining social interactions and cultural norms. Platforms such as Facebook, Twitter, and Instagram have transcended their roles as mere communication tools, becoming integral to our identity and the fabric of society. Beyond personal technology, the revolution has dramatically transformed the retail sector through e-commerce platforms, offering global shopping experiences from home. It has also spurred the growth of the gig economy, challenging conventional employment models, and catalysed the emergence of new industries, particularly in digital marketing and app development. However, this digital transformation is not without its challenges, including concerns over privacy due to the digitalisation of personal information, the threat of misinformation on social media, and fears of job displacement in the wake of advancing automation and artificial intelligence technologies.

Looking ahead, the future of this digital age appears poised for even greater changes with the advent of technologies like virtual reality (VR) and augmented reality (AR), which promise to revolutionise entertainment and education through immersive experiences. The potential of blockchain technology in ensuring more secure and transparent financial transactions and data security is another area of significant promise. Yet, despite its numerous benefits, the digital revolution brings forth substantial challenges, such as the digital divide, cybersecurity threats, and the ethical dilemmas posed by emerging technologies. In summary, as we continue to navigate this ever-evolving digital landscape, it is imperative to strike a balance between leveraging the opportunities presented by these technologies and addressing their associated risks, to harness the full potential of the digital revolution for societal benefit.

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
MID-SEMESTER EXAMINATION, MARCH 2024

Program: B.Tech. (CSE)
Department: CSE
Full Marks: 30

Semester: 2nd
Course Code: CS24107
Course Name: Web Technology
Duration of Examination: 2 hours

INSTRUCTIONS

- Answer all the questions. Assume Missing data, if any.
- ***SECTION I is to be attempted by CSE-I Students.***
- ***SECTION II is to be attempted by CSE-II and CSE-III students.***
- [redacted]
- Students are requested to write the Section they belong to on top of the answer script's first page.

SECTION I (For CSE-I only)

1. Write a JavaScript code using events to increase the size of the image when someone moves the mouse over the image and the image goes back to its normal size when mouse is moved away from the image. **(5M)** [CO2] [L3]

2. Write a JavaScript code to create a function that display "Hello" in the inner HTML of an element with the ID "demo". **(4M)** [CO2] [L3]
3. Write a CSS code to set the background-color to red, when user mouse over elements with the class "master". **(3M)** [CO2] [L3]
4. Write a CSS code to Insert the image "smiley.gif" before, and after any <p>element. **(3M)** [CO2][L3]
5. An address space has a total of 1,024 addresses. How many bits are needed to represent an address? Find the subnet mask in each case: **(6M)** [CO1][L1][L2]
   a. 1024 subnets in class A
   b. 32 subnets in class C
   c. 256 subnets in class B
   d. 4 subnets in class C
6. Write a Java socket program where client sends a text and server receives and prints it. **(4M)** [C01,CO5] [L4]
7. Write Servlet code which reads the name of the user entered in the HTML form and display the output in the browser. **(5M)** [C01,CO5] [L4]

SECTION II (For CSE-II and CSE-III only)

Q.1. a). Discuss about the hyperlinks in HTML with an example. Explain the following with respect to the tag used to create a hyperlink: i) target attribute ii). Absolute URLs vs. relative URLs.

(CO3) **(3 Marks)** (L1, L2)

b). Write the HTML code to create the following table. (CO3) **(3 Marks)** (L3)

Name		Roll Number	Grade
First Name	Last Name		
AAA	ZZZ	1001	B
BBB	YYY	1002	A

Q.2. a). Explain the tags to create different types of lists using relevant HTML code.

(CO3) **(3 Marks)** (L2)

b). Describe the CSS box model for the design and layout of HTML elements. How are an element's height and width calculated?

(CO3) **(3 Marks)** (L1, L2)

Q.3. a). Differentiate between pseudo-class and pseudo-element in CSS. Write an HTML and CSS code with a division (div) element; when you bring the mouse cursor over that division, it shows an image of your choice. [don't use JavaScript or JQuery]

(CO1, CO3) **(3 Marks)** (L2, L4)

b). Write a JavaScript and HTML code for taking the date of birth from the user, calculate the age, and show it in one element, just after leaving the date input field.

(CO1, CO3) **(3 Marks)** (L3, L4)

Q.4. a). Write a JavaScript code for changing the background color of all <p> elements using document.getElementsByTagName() method. (CO2, CO3) **(3 Marks)** (L3)

b). Discuss the following terms with respect to functions in JavaScript: Function expressions, Default parameters values, Arrow Function

(CO1, CO2) **(3 Marks)** (L3, L4)

Q.5. Write a JQuery and HTML code to create three different div elements along with some child elements. Perform the mouse enter event with one div, mouse leave with another div, and mouse over with the third div. At every event, show the number of calls (so far) for that event inside the respective div.

(CO1, CO2, CO3) **(6 Marks)** (L3, L4)

National Institute of Technology Patna

Department of Mathematics

Mid Semester Examination : March 2024

Course Name: **Engineering Mathematics – I** Course Code: MA24102

Program: B.Tech. **CSE (Group-III)**

Duration: 2 Hrs Full Marks: 30

Answer All The Questions

1. (a) Let X be a discrete random variable which takes only non-negative values. Suppose X has finite expectation μ. Then for any $c > 0$, prove that $P(X \geq c) \leq \frac{\mu}{c}$. [5M]

   (b) Define the moment generating function for a discrete random variable. Hence find the expectation of the random variable following Binomial (n, p) distribution using the moment generating function. [5M]

2. (a) A random variable X has a probability mass function given by $P(X = 0) = 0.2$, $P(X = 1) = 0.5$, $P(X = 2) = 0.2$ and $P(X = 3) = 0.1$. Find mean and standard deviation of X. [5M]

   (b) The probability density function of a continuous random variable X is

$$f(x) = \begin{cases} 2xe^{-x^2}, & x > 0 \\ 0, & \text{Otherwise.} \end{cases}$$

   Find the probability density function for X^2. [5M]

3. (a) An nptel homework assignment has three choices. Assume that only one of which is correct. A student doing the assignment knows the answer with probability $\frac{1}{4}$. If the student does not know the answer then the students guess randomly. Find the conditional probability that the student knew the answer given that the question was answered correctly. [5M]

   (b) Find $E(|X - \mu|)$ for the random variable X having the following pdf:

$$f(x) = \frac{1}{\sqrt{2\Pi}\sigma} e^{\frac{-(x-\mu)^2}{2\sigma^2}}, \quad -\infty < x < \infty$$

   where μ and σ are positive constants. [5M]

*****ALL THE BEST*****

NATIONAL INSTITUTE OF TECHNOLOGY, PATNA
MID SEMESTER EXAMINATION, March 2024

Program: B. Tech. [CSE and CSE(DD)]
Course Code: PH24101
Full Marks: 30

Semester: 2 Department: Physics
Course Name: Engineering Physics
Duration of Examination: 2 hours

Answer all questions. Please assume missing data suitably, if any.

Q1. (a) Write the equation of motion of a damped simple harmonic system. What are the different solutions of this equation? Discuss fully the case oscillatory damped simple harmonic motion. 7+3

(b) A spring constant 98 N/m is pulled through 20 cm. Find the restoring force and compute the mass which should be attached so as to stretch the spring by the same amount.

Q2. (a) Differentiate between **Curl** and **Divergence** of a vector field. The potential in a medium is given by $\varphi(r) = \frac{qe^{-r/\lambda}}{4\pi\varepsilon_0 r}$, obtain the corresponding electric field. Describe electrostatic boundary conditions for electric vector (**E**) across dielectric mediums. 7+3

(b) Derive the equation of continuity. How the Ampere's law gets modified in its generalized form?

Q3. (a) Establish the relations between three electric vectors. Discuss the displacement current. Find the volume charge density associated with a field given by $\mathbf{D} = 2x^3y^2\hat{i} + 3y^3x^2\hat{j} + 5z^5\hat{k}$ C/m^2. 7+3

(b) Discuss the different types of polarization mechanism in dielectric materials.

राष्ट्रीय प्रौद्योगिकी संस्थान पटना

National Institute of Technology Patna

End-Semester Exam (Jan-Jun'24)

Session: 2023-24 Spring'24 Semester

Department: Computer Science and Engineering

Programme: BTech(CSE-I,II,III), BTech+DD(CSE-CS,DS)

Semester: 2nd

Course Code: **CS24108**

Course: Computer Organization

Full Marks: 60

Duration: 3 hours

[Attempt all questions; Answer concisely only in blue/black ink; Use pencil for artwork; Assume missing data; No mobile phones] [No form of calculator is permitted]

[Marks, Course Outcome and Bloom's Level are mentioned on right-hand side of each question]

Sl.	Questions	CO	BL
1. a.	Consider the sequence of machine instructions given in the adjoining box, in which R0 to R8 are general-purpose registers. In the given instruction sequence, 3-address format is followed, where the first register stores result of operation performed on the second and third registers. This sequence is to be executed in a pipelined processor with 4 stages: (1) Instruction Fetch/Decode (IF), (2) Operand Fetch (OF), (3) Perform Operation (PO), (4) Write back result (WB). The stages IF, OF and WB take 1 clock cycle each, while PO takes 1 clock cycle for ADD or SUB, 3 clock cycles for MUL and 5 clock cycles for DIV. Operand forwarding is used from PO to OF. Determine a non-hazardous execution schedule of the given sequence in the specified pipeline, with minimum stalls and no change in instruction order. (Draw a timing diagram to show the schedule.) **(10)** I_1: MUL R5, R0, R1 I_2: DIV R6, R2, R3 I_3: ADD R7, R5, R6 I_4: SUB R8, R7, R4 मान लें एक मशीन इंस्ट्रक्शंस के सीक्वेंस, जैसा कि उपरोक्त संलग्न बॉक्स में दिए गए है, जिसमें R0 से R8 जनरल-पर्पस रजिस्टर हैं। उपरोक्त इंस्ट्रक्शन सीक्वेंस 3-एड्रेस फॉर्मेट के अनुसार सजाया गया है, जहां पहला रजिस्टर दूसरे और तीसरे रजिस्टर्स पर किए गए ऑपरेशन के परिणाम को संग्रहीत करता है। इस सीक्वेंस को 4 स्टेजेस वाले पाइपलाइनयुक्त प्रोसेसर में एक्सीक्यूट किया जाना है: (1) इंस्ट्रक्शन फ़ेच/डिकोड (IF), (2) ऑपरेंड फ़ेच (OF), (3) परफॉर्म ऑपरेशन (PO), (4) राइट बैक रिजल्ट (WB)। IF, OF और WB स्टेजेस प्रत्येक 1 क्लॉक साइकिल लेते हैं, जबकि PO स्टेज ADD या SUB के लिए 1 क्लॉक साइकिल, MUL के लिए 3 क्लॉक साइकिल और DIV के लिए 5 क्लॉक साइकिल लेता है। ऑपरेंड फ़ॉरवर्डिंग का उपयोग PO से OF तक किया जाना है। बताई गई पाइपलाइन में दिए गए सीक्वेंस का एक नॉन-हज़ारडॉस (गैर-खतरनाक) एक्सीक्यूशन शेड्यूल को निर्धारित करें, जिसमें न्यूनतम स्टालों हों और इंस्ट्रक्शन क्रम में कोई बदलाव न हो। (शेड्यूल दिखाने के लिए एक समय आरेख बनायें।) [Course outcome(s) evaluated: CO-6(Analyze/Determine)]	CO-6	Level-4
b.	A processor implements a scalar pipeline with 12 stages, where each stage completes in 1 clock cycle. The pipeline stalls only on conditional branch instructions until the conditions of the branches are evaluated. Assume that the pipeline does not stall for any other reason during execution of instruction sequence. A program with	CO-3	Level-3

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Sl.		Questions	CO	BL
1.	b.	1000 instructions completes in 2211 clock cycles. 200 of those instructions are conditional branches, each of which incurs branch penalty. What is the value of branch penalty for the given program in the above processor? **(5)**	CO-3	Level-3
		एक प्रोसेसर 12 स्टेजेस के साथ एक स्केलर पाइपलाइन इम्प्लीमेंट करता हैं, जहां प्रत्येक स्टेज 1 क्लॉक साइकिल में पूरा होता हैं। पाइपलाइन केवल कंडीशनल ब्रांच इंस्ट्रक्शंस पर स्टॉल होती हैं, और तब तक स्टॉल होती हैं जब तक ब्रांचेस की कंडीशंस का मूल्यांकन नहीं हों जाता। मान लों कि इंस्ट्रक्शन सीक्वेंस के एक्सीक्यूशन की दौरान पाइपलाइन किसी अन्य कारण से स्टॉल नहीं होती हैं। 1000 इंस्ट्रक्शंस वाला एक प्रोग्रॅम 2211 क्लॉक साइकिल में पूरा होता हैं। उन इंस्ट्रक्शंस में से 200 कंडीशनल ब्रांच इंस्ट्रक्शंस हैं, जिनमें से प्रत्येक पर ब्रांच पेनॉल्टी लगता हैं। उपरोक्त प्रोसेसर में दिए गए प्रोग्रॅम के लिए ब्रांच पेनॉल्टी का मूल्य क्या हैं?		
		[Course outcome(s) evaluated: CO-3(Apply/Solve)]		
2.	a.	Write the key characteristics of programmed I/O technique, interrupt-driven I/O technique and direct memory access (DMA), with illustrations. **(9)**	CO-1	Level-1
		प्रोग्रॅम्ड I/O तकनीक, इंटरप्ट-ड्रिवन I/O तकनीक और डायरेक्ट मेमोरी एक्सेस (DMA) की प्रमुख विशेषताओं को चित्र सहित लिखों।		
		[Course outcome(s) evaluated: CO-1(Remember/Recall)]		
	b.	Consider the following instruction sequence: I_1: ADD R9, R0, 500H I_2: ADD R8, R0, 400H I_3: MOV R7, [R8+0H] I_4: MOV [R8+800H], R7 I_5: ADD R8, R8, 4H Identify the three forms of data hazards that are possible in the above sequence. **(6)**	CO-6	Level-4
		मान लों उपरोक्त इंस्ट्रक्शन सीक्वेंस। उपरोक्त सीक्वेंस में संभावित डेटा हज़ार्डस के तीन प्रकारों को निर्धारित करों।		
		[Course outcome(s) evaluated: CO-6(Analyze/Determine)]		
3.	a.	Consider a pipelined processor, which is developed based on the following 3-address formats in instruction set architecture (ISA): <Op> <Reg>, <Reg>, <Mem> <Op> <Reg>, <Mem>, <Reg> <Op> <Reg>, <Mem>, <Immediate> <Op> <Mem>, <Reg>, <Reg> <Op> <Mem>, <Reg>, <Immediate> Implement an instruction sequence for performing the following arithmetic operation in that processor: $$Z = \frac{P+Q}{N-(S \times T)}$$ The instruction sequence must have minimum number of data dependencies. Assume that the above processor only supports ADD, SUB, MUL and DIV instructions, and has 6 architectural registers: R1 to R6.	CO-5	Level-3
		मान लों पाइपलाइनयुक्त प्रोसेसर, जिसे उपरोक्त 3-एड्रेस फॉर्मेट वाले इंस्ट्रक्शन सेट आर्किटेक्चर (ISA) के आधार पर बनाया गया हैं। उस प्रोसेसर में उपरोक्त अंकगणितीय ऑपरेशन करने के लिए एक इंस्ट्रक्शन सीक्वेंस इम्प्लीमेंट करों। इंस्ट्रक्शन सीक्वेंस में डेटा डिपेंडेंसी (निर्भरता) की न्यूनतम **(4)**		

Sl.		Questions	CO	BL
3.	a.	संख्या होनी चाहिए। मान लों कि वह प्रोसेसर केवल ADD, SUB, MUL और DIV इंस्ट्रक्शंस को ही एक्सीक्यूट करता है, और उसमें 6 आर्किटेक्चरल रजिस्टर हैं: R1 से R6 तक। [Course outcome(s) evaluated: CO-5(Apply/Implement)]	CO-5	Level-3
	b.	A SPEC benchmark program is executed on a 40-MHz nonpipelined uniprocessor system. The program consists of 100000 instructions, with its instruction mix and clock cycle per instruction (CPI) given in the adjacent box. Calculate the average CPI and CPU time (i.e., execution time) of this program when executed by the specified processor. (4) [Given: $\frac{1}{1.55} \approx 0.645$; $\frac{1}{25.8} \approx 0.03876$]	CO-3	Level-3

Instruction Type	Instruction Count	CPI
Integer arithmetic	45000	1
Data transfer	32000	2
Floating point	15000	2
Control transfer	8000	2

एक SPEC बेंचमार्क प्रोग्रॅम 40-मेगाहर्ट्ज नॉनपाइपलाइन यूनिप्रोसेसर सिस्टम पर एक्सीक्यूट होता हैं। वह प्रोग्रॅम में 100000 इंस्ट्रक्शंस शामिल हैं, जिसका इंस्ट्रक्शन मिश्रण और क्लॉक साइकिल प्रति इंस्ट्रक्शन (CPI) उपरोक्त संलग्न बॉक्स में दिए गए हैं। उपरोक्त प्रोसेसर द्वारा एक्सीक्यूट होने पर इस प्रोग्रॅम के एवरेज CPI और CPU समय (अर्थात, एक्सीक्यूशन समय) की गणना करों।
[Course outcome(s) evaluated: CO-3(Apply/Solve)]

	c.	Consider a fully-associative cache memory system with capacity of 16384_{dec} cache lines and block size of 4_{dec} words (word-length = 1_{dec} Byte). Also, the main memory contains 4194304_{dec} blocks. Consider a main memory location having address $(2744AD)_{hex}$ and storing data $(89)_{hex}$. When the corresponding block is transferred to the fully-associative cache memory, explain why it is allocated at the cache line number 5_{dec} and why the TAG field of that cache line is holding the value $(09D12B)_{hex}$? (7) मान लों एक फुल्ली-एसोसिएटिव कैश मेमोरी सिस्टम, जिसमें 16384_{dec} कैश लाइनों शामिल हैं, और ब्लॉक साइज़ 4_{dec} वॉर्ड्स के हैं (एक वॉर्ड-लेंथ = 1_{dec} बाइट)। साथ ही, मैन मेमोरी में 4194304_{dec} ब्लॉक्स हैं। मान लों उस मैन मेमोरी पर एक जगह हैं, जिसका पता $(2744AD)_{hex}$ और डेटा $(89)_{hex}$ संग्रहीत हैं। जब संबंधित ब्लॉक को पूरी तरह से सहयोगी कैश मेमोरी में भेजा जाता हैं, तो फ़िर व्याख्या करों कि इसे 5_{dec} नंबर कैश लाइन पर क्यों नियत किया गया हैं, और उस कैश लाइन का TAG फ़ील्ड क्यों मान $(09D12B)_{hex}$ को रखता हैं? [Course outcome(s) evaluated: CO-2(Understand/Explain)]	CO-2	Level-2
4.	a.	A cache memory unit with capacity of N words and block size of B words is to be designed. If it is designed as direct-mapped cache, the length of TAG field is 10 bits. If the cache unit is now designed as 16-way set-associative cache, what is the length of TAG field? (4) एक कैश मेमोरी यूनिट को डिज़ाइन की जानी हैं, जिसका कैपेसिटी N वॉर्ड्स हैं, और ब्लॉक साइज़ B वॉर्ड्स हैं। यदि इसे डायरेक्ट-मैप्ड कैश के रूप में डिज़ाइन किया जाता हैं, तो TAG फ़ील्ड की लंबाई 10 बिट हैं। यदि कैश यूनिट को अब 16-वे सेट-एसोसिएटिव कैश के रूप में डिज़ाइन किया जाएगा, तो TAG फ़ील्ड की लंबाई क्या हैं? [Course outcome(s) evaluated: CO-3(Apply/Solve)]	CO-3	Level-3
	b.	A dynamic random access memory (DRAM) cell typically has a capacitor as one of its components. Since a capacitor is not a digital entity, then explain how one DRAM cell is capable of holding 1_{dec} bit data? (4)	CO-2	Level-2

Sl.		Questions	CO	BL
4.	b.	एक डायनामिक रैंडम एक्सेस मेमोरी (DRAM) सेल में आमतौर पर एक कैपेसिटर होता हैं। चूँकि कैपेसिटर एक डिजिटल एंटिटी नहीं हैं, तो फ़िर व्याख्या करों कि एक DRAM सेल 1_{dec} बिट डेटा को कैसे संग्रहीत करने में सक्षम हैं?	CO-2	Level-2
		[Course outcome(s) evaluated: CO-2(Understand/Explain)]		
	c.	Describe the memory hierarchy of a desktop computer system. (7) डेस्कटॉप कंप्यूटर सिस्टम की मेमोरी हायरार्की को वर्णन करों।	CO-1	Level-1
		[Course outcome(s) evaluated: CO-1(Remember/Recall)]		

List of Course Outcomes of "Computer Organization": After completing this course, a student should be able to —

CO-1. *recall* computer organization terminologies, as well as fundamental concepts, operating principles and methods about structures and functions of computer systems and their components;
[Bloom level: Remember; Mapped to: PO-1]

CO-2. *explain* concepts and techniques in functioning of arithmetic logic unit (ALU), floating-point unit (FPU), control unit (CU), instruction set architecture (ISA), memory hierarchy and input/output unit;
[Bloom level: Understand; Mapped to: PO-1, PO-2]

CO-3. *solve* problems on principles of arithmetic/logic functions, control mechanisms, cache, primary, secondary memory addressing, I/O addressing, instruction pipelining, as well as their performances;
[Bloom level: Apply; Mapped to: PO-1, PO-2, PO-3]

CO-4. *use* software tools for designing and evaluating microarchitecture in computer system for given ISA;
[Bloom level: Apply; Mapped to: PO-3, PO-5]

CO-5. *implement* assembly-language programs to fulfil program objectives in computer system for given ISA;
[Bloom level: Apply; Mapped to: PO-3, PO-5]

CO-6. *determine* pipeline hazards in computer system for given execution sequence.
[Bloom level: Analyze; Mapped to: PO-1, PO-2, PO-3]

---------- "BEST WISHES" ----------

NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Department of Humanities and Social Sciences
Ashok Rajpath, Patna-800 005

END-SEMESTER EXAMINATION MAY 2024

Course Name: Communicative English
Group: B.Tech (CSE 1, CSE 2, CSE 3, CSE DD)
Faculty: Dr. Zeeshan Ali

Course Code: HS24101
Full Marks: 45
Time: 3 Hours

Instructions: **Answer all the questions in your own words**

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1. Critique the significance of clarity and fluency in spoken English. Propose and justify strategies that could markedly enhance these aspects of speech in professional settings. (11 marks) CO5

2. Synthesize various techniques to boost comprehension when engaging with complex academic texts, especially in technical disciplines such as engineering. Illustrate your discussion with specific examples. (11 marks) CO6

3. Evaluate the impact of effective communication and teamwork on the dynamics and outcomes of group discussions in academic environments. Cite examples to support your analysis. (11.5 marks) CO8

5. Design a blueprint for a successful presentation that incorporates key elements essential for engaging an audience and effectively conveying complex information. Analyse how these elements interact to enhance communication effectiveness. (11.5 marks) CO8

[Note: In your answers add examples to explain your points]

END SEMESTER EXAMINATION, May 2024

Program: B. Tech. (CSE & DD) **Semester:** 2 **Department:** P...ngs
Course Code: PH24101 **Course Name:** Engineering Physics
Full Marks: 60 **Duration of Examination:** 3 hours

Answer all questions. Assume missing data suitably, if any.

Q1. (a) Define Hooke's law. A 2 m long metal wire with 1.5 mm diameter is loaded, resulting in a 4 mm elongation. Find the change in diameter of wire (Poisson's ratio of wire is 0.24). **[5]**

(b) What are the characteristics of a harmonic motion? Obtain the differential equation of motion of a simple harmonic oscillation, and find its solution. **[10]**

Q2. (a) Write Maxwell's equations for em fields with their physical significances. Prove transverse nature of em wave. **[5]**

(b) Discuss and derive Poynting theorem. Calculate the value of Poynting vector at the surface of the sun if the power radiated by the sun is 3.8×10^{26} Watt and its radius is 7×10^{8} m. **[10]**

Q3. (a) Describe an expression of intensity at a point for Fraunhofer diffraction due to a single slit. Draw the intensity distribution curve. **[5]**

(b) Write the characteristics of laser light. Explain the construction and working principle of He-Ne laser. **[10]**

Q4. (a) Explain de–Broglie hypothesis and write the properties of matter waves. Calculate the ratio of de-Broglie waves associated with a proton and an electron each having the kinetic energy as 20 MeV; Given $m_p = 1.67 \times 10^{-27}$ kg and $m_e = 9.1 \times 10^{-31}$ kg. **[5]**

(b) Write physical significance of wave function and develop Schrodinger's time-independent wave equation. Show that a particle moving in a one-dimensional potential well possesses only discrete set of energy values. **[10]**

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
END-SEMESTER EXAMINATION, MAY 2024

Program: B.Tech. (CSE) **Semester:2nd**
Course Name: Web Technology **Course Code: CS24107**
Full Marks: 60 **Duration of Examination:** 3 Hr.

INSTRUCTIONS

- Answer all the questions. Assume Missing data, if any
- ***SECTION I is to be attempted by CSE-I***
- ***SECTION II is to be attempted by CSE-II and CSE-III students.***
- Students are requested to write their Section on top of the answer script's first page.

SECTION I (For CSE-I only)

1. Create a web application where a user submits his or her roll number in HTML form and fetches his/ her name, marks and grade from data base. Use Servlet for backend processing. (Hint: create HTML form and a Java Servlet code).
(10M) [CO1,CO5] [L4]
2. Create a simple Login and logout web application using Servlet Cookies and HTTP session.
(10M) [CO1,CO5] [L4]
3. Create a Java JDBC program where the user uploads its image, biodata, and name to the back-end database.
(10M) [CO2] [L3]
4. Create the following table using Java Swing. Also add a code to display the name of the selected element in column on the console. (10 M) [C02,CO4][L3]

ID	NAME	SALARY
101	Amit	67000
102	Abhinav	78000
103	Rahul	90000

5. Solve the following question: (10M) [CO3] [L3]
   a. Set the background-color to red, of any <input> element that are in focus.
   b. Set a border for <img> elements that have a title attribute *ending* with the word flower (not flowers).
   c. Set the background color to "red" for <a> elements that have a target attribute.
   d. Set the background-color to red, when you mouse over elements with the class "master".
   e. Collect user-name through a pop up box and display the collected user name in a pop-up box.
6. Write a JSP code which reads the name of the user entered in the HTML and display the name in the browser. (5M) [CO1,CO5][L4]

7. Write a JavaScript code to send user first name and last name from HTML form to the server. (5M) [C03,CO2][L3]

SECTION II (For CSE-II and CSE-III only)

1. **a).** Explain the difference between $('selector'), $(this), and $(document) in jQuery. [3M][CO1][L3]

b). How do you manipulate CSS properties and attributes of a DOM element using jQuery? Explain using examples. [3M] [CO1][L3, L4]

c). How does jQuery facilitate AJAX requests? Explain with a code example how to make an asynchronous request to a server and dynamically update webpage content based on the received response. [4M] [CO1, CO3][L2,L3]

Q. 2. a). Explain the different CSS positioning properties: static, relative, absolute, and fixed. Describe when each positioning type is used and how they affect the layout of elements on a webpage. [5M] [CO1][L2, L3]

b). Explain how to set, get, and remove cookies on the client side using JavaScript. Include the required source code. [5M] [CO1][L4]

Q.3. a). What are the different methods that can be used in the Servlet lifecycle? Specify the significance of each method. [5M] [CO5][L1,L2]

b). Elaborate upon the life cycle of JSP. Discuss the differences between Servlet and JSP. [5M] [CO5][L1,L2]

Q.4. What is jsp:useBean action tag? Create the bean class "AddSub", which can be used to perform addition and subtraction of two numbers. Use this class in the JSP page as JavaBeans. Include the required source code. [10M] [CO5][L1,L4]

Q.5. a). What are the different session tracking techniques in Servlet? Explain briefly. Explain the URL rewriting session tracking mechanism in the scenario of keeping the user name in different servlets of an application. [7M] [CO5][L2, L4]

b). Explain the following scripting elements in JSP with an example. [3M] [CO5][L3]

I.scriptlet tag
II.expression tag
III.declaration tag

Q.6. a). What is page directive? Explain the following attributes of page directive using the necessary code snippet: Import, buffer, errorPage, session. [5M] [CO5][L2, L4]

b). Create a webpage for event registration, where users can enter userID, password, name, Mobile No (without country code), Email ID, and sign up by clicking the 'Register' button. Include validation to ensure that no field is empty before submission. Additionally, ensure that the Email ID and Mobile Number are in the correct format, and passwords must contain at least 10 characters, including at least 1 digit, 1 special character, and a mix of letters. [5M] [CO1][L4]

National Institute of Technology Patna

Department of Mathematics

End Semester Examination : May 2024

Course Name: **Engineering Mathematics – I** Course Code: *MA24102*

Program: B.Tech. **CSE (Group-I)**

Duration: 3 Hrs Full Marks: 60

Answer All The Questions

1. There are three coins, identical in appearances, one of which is unbiased and other two are biased with probabilities 1/3 and 2/3 respectively, for a head. One coin is taken at random and tossed twice. If a head appears both times, what is the probability that the unbiased coin was chosen? [6M]

2. A coin is tossed three times in a succession. Let X denote the number of heads. Find the distribution function of the random variable X. [6M]

3. For a monotone sequence of events $\{A_n\}_{n=1}^{\infty}$, prove that, $P(\lim_{n\to\infty} A_n) = \lim_{n\to\infty} P(A_n)$ [6M]

4. The random variable X is distributed uniformly over the interval (0, 2). Find the distribution function of the larger root of the quadratic equation $t^2 + 2t - X = 0$. [6M]

5. The density function of the two dimensional random variable (X, Y) is given by

$$f(x) = \begin{cases} kxy(1-x-y), & x \geq 0, y \geq 0, x+y \leq 1 \\ 0, & \text{elsewhere.} \end{cases}$$

Find (a) the value of the constant k, (b) the marginal distributions, (c) $P(X \leq 1/2, Y \leq 1/2)$ [6M]

6. Let X, Y be two random variables, each having spectrum $(-\infty, \infty)$. If the conditional density function of X given Y is $\frac{|x|e^{-x^2y^2}}{\sqrt{\pi}}$ and the density function of Y is $\frac{2e^{-y^2y^2}}{\sqrt{\pi}}$, prove that the density function of X is $\frac{\lambda}{\pi(\lambda^2+x^2)}$. [6M]

7. The joint probability distribution of two random variables X and Y is given by
$P(X = 0, Y = 1) = 1/3$, $P(X = 1, Y = -1) = 1/3$, $P(X = 1, Y = 1) = 1/3$.
Find (i) the marginal distributions of X and Y and (ii) the conditional distribution of X given $Y = 1$. [6M]

8. Find the first absolute moment about the mean of the normal (m, σ^2) distribution. [6M]

9. Find the moment generating function of the normal (m, σ^2) distribution. [6M]

10. A random variable X has probability density function $f(x) = \frac{1}{2}e^{-|x|}, -\infty < x < \infty$; show that the moment generating function of X is given by $\phi(t) = \frac{1}{1-t^2}$. Hence, find $Var(X)$. [6M]

*****ALL THE BEST*****