

Mid-Semester Examination, September-2019
Introduction to Computer Programming(CSE 1001)

Semester: 1st
 Full mark: 30

Branch: All
 Time: 2 Hours

Subject Learning Outcome	*Taxonomy Level	Ques. No.	Marks
Attain the knowledge of problem solving using programming language like Java.	L1	2(a),5(b,c), 3(c)	8
Design the procedural programming elements.	L3	2(b,c),3(a,b) ,4(a,b)	12
Analyze, test and debug programs that meet the desired outcomes. Combine multiple programming elements.	L4	1(a,b,c)	6
	L3	5(a),4(c)	4

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all five questions.

All questions carry equal marks. All bits of each question carry equal marks.

Q1. Find error or output of the given code snippets.

(a)

```
int a,b;
a=-13-2*5-4;
b=a/8*4%5+6;
System.out.println(a+" "+b);
a&=~a;
b=-a--;
System.out.println(a+" "+b);
```

2

(b)

```
int a=2,b=5,c=7;
System.out.println(a<b&&a++<c);
System.out.println(a++ +b-- *c);
System.out.println(c++ -b +a);
```

2

(c)

```
int x=-7,a=5,b=5;
boolean k;
System.out.println(x>>1);
System.out.println("Hello" + 10 + 15);
k=(a<b)&&(++b==a);
System.out.println(b+" "+k);
```

2

Q2.

(a)

Write the java statements to exchange the value of 4 variables W, G, K, A, such that the value of W will move to A, A to K, K to G and finally G to W. Don't use extra variable. 2

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- (b) Write a java program that takes three positive integers from the command line arguments and print true if any one of them is greater than or equal to the sum of the other two and false otherwise. Don't use if. 2

- (c) Write a java program that prompt the user to enter two points $(x_1, y_1), (x_2, y_2)$ and display the distance between them. 2

Q3.

- (a) Write a java program to input two number m and n (must greater than two digit number) 2
Find the sum of second last digits of m and n.

- (b) Write the java statements to input a character from the keyboard, then print whether the entered character is an English alphabet or digit. 2

- (c) Draw the control flow diagram to find the greatest among four numbers without using compound condition like $(a > b \&\& a > c \&\& a > d)$. 2

Q4.

- (a) Write the java statements that takes the x - y coordinates of a point in the Cartesian plane and prints a message telling either an axis on which the point lies, or in the origin, or the quadrant in which it is found. 2

- (b) Write the java statements to input amount from user and print minimum number of notes (Rs. 2000, 500, 100, 50, 20, 10, 5, 2, 1) required for the amount. 2

- (e) Write the java statements to print the grade according to the mark secured by the student using switch case. 2

Mark Range	Grade
≥ 95	O
$\geq 85 \text{ AND } < 95$	A
$\geq 75 \text{ AND } < 85$	B
$\geq 65 \text{ AND } < 75$	C
$\geq 55 \text{ AND } < 65$	D
$\geq 45 \text{ AND } < 55$	E
< 45	F

Q5.

- (a) Write the java statements to find the sum of digits of a given number n . Print the sum as well as print whether the number n is divisible by sum or not. 2

- (b) Draw the flow diagram for the question no. 5(a). 2

- (c) Write the execution pattern for the question no. 5(a). 2

**MID SEMESTER EXAMINATION, OCTOBER-2019
DISCRETE MATHEMATICS (CSE 1002)**

Programme:B.Tech

Full Marks: 30

Semester:1st

Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Analyze and apply rules of logic to distinguish between valid and invalid arguments and use them to prove mathematical statements.	L1, L3, L3, L2, L2,L3	1(a),1(b), 1(c),2(a), 2(b), 2(c)	2,2, 2,2, 2,2
Discuss sets, their various operations and use them to analyze functions and its various concepts as well as study sequences and summation.	L3, L3, L3,L3, L3,L3	3(a),3(b), 3(c), 4(a), 4(b),4(c)	2,2, 2,2, 2,2
Analyze the searching and sorting algorithms and use the growth of functions to study the time complexity of algorithms.	L3, L3, L3	5(a), 5(b), 5(c),	2,2, 2

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. (a) Write the negation of the given proposition 2
'It is below freezing and snowing.'
- (b) Determine whether $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology or not. 2
- (c) Use a proof by contraposition to prove that if n is an integer and $n^3 + 5$ is odd , then n is even. 2

2. (a) Translate the following statement into a logical expression using predicates, quantifiers and logical connectives. 2
'No large birds live on honey.'
- (b) Translate the following logical expression into English, where the domain for each variable consists of all real numbers. 2
 $\forall x \forall y \exists z (xy = z)$

- (c) Use rules of inference to show that the premises 'If it does not rain or if it is not foggy, then the sailing race will be held and the life saving demonstration will go on,' 'If the sailing race is held, then the trophy will be awarded,' and 'The trophy was not awarded,' imply the conclusion 'It rained.' 2
3. (a) Determine whether the following statements are true or false. 2
 (i) $0 \in \emptyset$ (ii) $\{\emptyset\} \in \{\emptyset\}$
- (b) Show that if A and B are sets, then $(A \cap B) \cup (A \cap \bar{B}) = A$. 2
- (c) Evaluate $\sum_{i=0}^2 \sum_{j=0}^3 ij$. 2
4. (a) Let $f(x) = x + 1$ be a function from the set of integers to the set of integers and let $g(x) = x^2$ be another function from the set of integers to the set of integers. Find $(fog)(x)$ and $(gof)(x)$. 2
 (b) Determine whether the given function is a bijection from R to R . 2
- $f(x) = -3x + 7$
- (c) Prove or disprove that $\lfloor x+y \rfloor = \lfloor x \rfloor + \lfloor y \rfloor$ for all real numbers x and y . 2
5. (a) Use the bubble sort algorithm to sort 6,2,3,1,5,4 showing the lists obtained at each step. 2
 (b) Determine whether $5\log x$ is $O(x)$. 2
 (c) Show that $x^2 + 1000$ is $\Omega(x^2)$. 2

End of Questions

MID SEMESTER EXAMINATION, SEPTEMBER-2019
University Physics: Mechanics (PHY 1001)

Programme: B. Tech

Semester: 1st

Full Marks: 30

Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
UPM/ a, e	L ₁ , L ₂ , L ₃	1	6
UPM/ a, e	L ₁ , L ₂ , L ₃	2	6
UPM/ a, e, g	L ₁ , L ₂ , L ₃	3	6
UPM/ a, e, g	L ₁ , L ₂ , L ₃	4	6
UPM/ a, e	L ₁ , L ₂ , L ₃	5	6

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. ~~(a)~~ Find the angle between the vectors $\vec{A} = 2\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{B} = -4\hat{i} + 2\hat{j} - \hat{k}$ using scalar product of vectors. 2
~~(b)~~ Two displacement vectors, \vec{S} and \vec{T} have magnitudes $S = 3\text{ m}$ and $T = 4\text{ m}$. Which of the following could be the magnitude of the difference vector $\vec{S} - \vec{T}$? (i) 9 m; (ii) 7 m; (iii) 5 m; (iv) 1 m; (v) 0 m; (vi) -1 m. Justify your answer. 2
~~(c)~~ Vector \vec{A} has magnitude 6 units and is in the direction of +x-axis. The vector \vec{B} has magnitude 4 units and lies in the xy-plane, making an angle of 30° with the +x-axis. Find the vector product $\vec{C} = \vec{A} \times \vec{B}$. 2
2. ~~(a)~~ Derive the kinetic equation, $2a_x(x - x_0) = v_x^2 - v_{0x}^2$. The symbols have their usual meaning. 2
~~(b)~~ If you toss a ball upward with a certain initial speed, it reaches a maximum height h at a time 't' after it leaves your hand. If 2

you throw the ball upward with double the initial speed, what new maximum height does the ball reach and, how long does it take to reach the new maximum height? ($g = 9.8 \text{ m/s}^2$)

(c) A stone is thrown up vertically with a velocity of 20 m/s . Find out the instances at which the magnitudes of its, (i) momentum and (ii) kinetic energy will be half its initial value ($g = 9.8 \text{ m/s}^2$). 2

3. (a) A projectile is fired upward at an angle ' α ' above the horizontal with an initial speed v_0 . Prove that the trajectory of the projectile is a parabola. 2

(b) Suppose the nose of an airplane is pointed due east and the airplane has an air speed of 150 km/h . Due to the wind, the airplane is moving due north relative to the ground and its speed relative to the ground is 150 km/s . What is the velocity of the air relative to the earth? 2

(c) A ladder of 6 m length, which is in contact with a vertical wall and horizontal ground slides down the vertical plane. When the lower end is at a distance of 3 m from the wall, its velocity is 4 m/s . What is the velocity of the upper end at that instant? 2

4. (a) The sports car is rounding a flat, unbanked curve with radius R . If the coefficient of static friction between tires and road is μ_s , what is the maximum speed v_{max} at which the driver can take the curve without sliding? 2

(b) Suppose an astronaut landed on a planet where $g = 19.6 \text{ m/s}^2$. Compared to earth, would it be easier, harder, or just as easy for her to walk around? Would it be easier, harder, or just as easy for her to catch a ball that is moving horizontally at 12 m/s . 2

(c) The upward normal force exerted by the floor is 620 N on an elevator passenger who weighs 650 N . What are the reaction forces to these two forces? Is the passenger accelerating? If so, what are the magnitude and direction of the acceleration? 2

5 (a) Derive Work-Energy Theorem for a particle moving along a straight line enacted by a variable force. 2

(b) An electron moves in a straight line toward the east with a constant speed of 8×10^7 m/s. It has electric, magnetic, and gravitational forces acting on it. During a 1-m displacement, the total work done on the electron is (i) positive; (ii) negative; (iii) zero; (iv) not enough information given to decide. Justify your answer.

(c) A force in the $+x$ -direction with magnitude $F(x) = 18 N - (0.53 N/m)x$ is applied to a 6 kg box that is sitting on the horizontal, frictionless surface of a frozen lake. $F(x)$ is the only horizontal force on the box. If the box is initially at rest at $x = 0$, what is its speed after it has travelled 14 m?

End of Questions

MID-SEMESTER EXAMINATION, SEPTEMBER-2019

CALCULUS - I (MTH-1001)

Programme: B.Tech

Full Marks: 30

Semester: 1st

Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Use limit laws to evaluate the limit of a function and demonstrate the existence of limit and continuity of functions .	1.L1,L1,L1 2.L3,L3	1.a,b,c 2.b,c	2,2,2 2,2
Compute slope of tangent lines and derivatives by different techniques of functions and solve various physical and Engineering problems .	2. L1 3.L1,L1,L3 4.L1,L1	2.a 3.a,b,c 4.a,b	2 2,2,2 2,2
Discuss the Mean Value Theorems and study maximum and minimum values of a function as well as apply L' Hospital's rule to evaluate limits of functions and sketch curves of functions	4.L1 5.L1,L1,L3	4.c 5.a,b,c	2 2,2,2

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. (a) Find $\lim_{x \rightarrow -2} \frac{2-|x|}{2+x}$, if it exists and if it does not exist, explain why. 2
- (b) Discuss the continuity of the function $f(x) = \begin{cases} e^x & \text{if } x < 0 \\ x^2 & \text{if } x \geq 0 \end{cases}$ at $x=0$. 2
- (c) Explain that $\lim_{x \rightarrow 3}[x]$ does not exist. 2

2. (a) Show that the function $f(x) = |x - 6|$ is not differentiable at 6. Find a formula for f' and sketch its graph. 2
- (b) Use limit to find the horizontal asymptote of the curve $y = \frac{x^3 - x}{x^2 - 6x + 5}$. 2
- (c) Use the ϵ, δ definition of limit to prove that $\lim_{x \rightarrow 0} |x| = 0$. 2
3. (a) Where does the normal line to the ellipse $x^2 - xy + y^2 = 3$ at the point $(-1, 1)$ intersect the ellipse a second time? 2
- (b) Calculate $\frac{d^{99}}{dx^{99}}(\sin x)$ by finding the first few derivatives. 2
- (c) Use derivative to find equation of tangent line and normal line to the curve $y = x^2 - x^4$ at the point $(1, 0)$. 2
4. (a) Find y' if $x^y = y^x$ by using logarithmic differentiation. 2
- (b) If a rock is thrown vertically upward from the surface of Mars with velocity 15 m/s , its height after t seconds is $h = 15t - 1.86t^2$. What is the velocity of the rock when its height is 25 m on its way up? On its way down? 2
- (c) If $f(1) = 10$ and $f'(x) \geq 2$ for $1 \leq x \leq 4$ then find the smallest possible value of $f(4)$. 2

5. (a) Identify the intervals on which
 $f(x) = 2x^3 - 3x^2 - 12x$ is increasing.

2 .

(b) Let a be a fixed point of a function f . If $f'(x) \neq 1$ for all real numbers x , then show that f has at most one fixed point.

2

(c) Apply the closed interval method to determine the absolute maximum and absolute minimum values of the function $f(x) = x^3 - 3x + 1$ in the interval $[0, 3]$.

2

End of Questions

MID SEMESTER EXAMINATION, SEPTEMBER-2019

Principles of Microeconomics (HSS1021)

Programme: B.Tech

Full Marks: 30

Semester: 1st

Time: 2 Hours

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Understand various economic principles and models, and utilize these in decision making pertaining to an individual and economy as a whole.	L.1 L.2 L.4	1 2 4	18
Understand the twin forces of market, i.e., demand and supply, derived from consumer's and producers' behavior, determine the equilibrium price and quantity and analyze the effect of change in various factors on market equilibrium	L.3	2	6
Describe and calculate elasticity of demand and supply as responsiveness to changes in various variables from market data, and apply them in decision making process of consumers, producers and government.	L.5	2	6

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1.	(a) <i>(u)</i>	Suppose the Govt. increases tax on cigarettes. As a result the teenage smoking rate has reduced. Analyse the situation by stating the relevant basic principles of economics.	2
	(b)	Does a trade off between inflation and unemployment exist in short run? Justify your answer.	2
	(c)	In what ways your standard of living is different from that of your parents or grandparents when they were of your age? Why have these changes occurred?	2

2.	<p>Assume that a small country produces two commodities, Ball and Micro-wave. The quantity of balls and micro-waves that can be produced by utilizing the available resources is given in the table below.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Products</th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th></tr> </thead> <tbody> <tr> <td>Ball (no.)</td><td>750</td><td>600</td><td>450</td><td>300</td><td>150</td><td>0</td></tr> <tr> <td>Micro-wave (no.)</td><td>0</td><td>200</td><td>400</td><td>550</td><td>600</td><td>650</td></tr> </tbody> </table>	Products	A	B	C	D	E	F	Ball (no.)	750	600	450	300	150	0	Micro-wave (no.)	0	200	400	550	600	650	2
Products	A	B	C	D	E	F																	
Ball (no.)	750	600	450	300	150	0																	
Micro-wave (no.)	0	200	400	550	600	650																	
	(a) Draw the country's production possibilities frontier (PPF) based on the above data.																						
	(b) Calculate the unit opportunity cost of producing balls at each possibility given in the above data? Do you find any relationship between the unit opportunity cost you derive and the PPF drawn above?	2																					
	(c) If the country wants to produce 480 no. of Balls and 530 no. of Microwaves, analyse the situation in terms of feasibility and efficiency.	2																					
3.	Suppose the market demand and market supply of chocolates per day in Banaras City is given as $Q^d = 42 - 3P$, $Q^s = -8 + 2P$, where Q^d and Q^s refer to quantity demanded and quantity supplied of chocolates measured in numbers and P refers to the price of the chocolates (Rs.).	2																					
	(a) Draw the demand and supply curve and show the market equilibrium price for the chocolates. What is the quantity demanded and supplied at equilibrium price? $P = 10, Q = 12$																						
	(b) Graphically analyse the market situation if the actual price of chocolates is Rs. 15? What will happen to the price of chocolates in the given situation? <i>Surplus</i> .																						
	(c) Analyse the effect of reduced milk price and the impact of the doctor's statement that more consumption of chocolates will create more dental problems on demand, supply, price, quantity demanded and quantity supplied of chocolates.	2																					
4.	(a) Represent the interrelationship between the Consuming and Producing sectors of economy through a circular flow diagram.	2																					
	(b) Imagine a hypothetical economy, where there is one firm i.e., Shalimar Edible oil mill. The oil mill produces 3500 liters of oil per month and sell it for Rs. 90 per litre. It employs 12 labourers at a wage rate of Rs. 300 per day and pays a rent of Rs. 15,000 per month. Show these transactions in a circular flow model.																						

	<u>(e)</u>	Elaborate the functions of households and firms with respect to circular flow diagram.	2
5.	<u>(a)</u>	Assume that product A is a normal good and product B is an inferior good. If the income of the consumer increases, graphically analyse its effect on demand for good A and B.	2
	<u>(b)</u>	When price of a good is 13 per unit, the consumer buys 11 units of that good but when price rises to 15 per unit, the consumer continues to buy 11 units. Calculate price elasticity of demand by using the mid-point method.	2
	<u>(c)</u>	A 5% fall in price of a good leads to 10% rise in its demand. A consumer buys 40 units of a good at a price of Rs. 10 per unit. How many units will he/she buy at a price of 12 per unit? Calculate.	2
End of Questions			