B.Sc. 3rd Semester (Honours) Examination, 2019-20

MATHEMATICS

Course ID : 32115 **Course Code : SHMTH-305/SEC-1**

Course Title: Programming Using C (New)

Time: 2 Hours **Full Marks: 40**

The figures in the right hand side margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Unless otherwise mentioned, notations and symbols have their usual meaning.

1. Answer *any five* questions: 2×5=10

(a) What are the differences between low level language and high level language?

(b) Express the following expression as valid *C*-expression: Sec $X + \frac{1}{\text{Sin}\,x + \text{Cosec}\,x}$.

(c) Give reasons why the following constants are not granted as *C* real constants:

(i) 3A2·8B (ii) 13E13 (iii) 1·3E1·3 (iv) –132

(d) What is the difference between "`printf`" and "`fprintf`" functions?

(e) Point out errors, if any in *C*:

(i) `3·14*r*r*h = Vol-of-cyl;`

(ii) `y-inst=rate of interest*amount in rs;`

(f) Find the output

```
int a=5, b=2; int c; c=a%b; printf ("%d ", c);
```

(g) How many times will the following loop execute?

```
int i; for(i=0; i<10; i++)
        {
        Printf("%d\n", i++);
        I=++i;
        }
```

(h) What is the difference between $++i$ and $i++$?

2. Answer *any four* questions: 5×4=20

(a) (i) What are the differences between the break and continue statements in C programming?

(ii) Write a do-while loop to evaluate and print the values of the quadratic polynomial $y = x^2 + 10x - 11$ for the values of $x = 0{\cdot}0$ to $1{\cdot}0$ with step 0·2. 2+3=5

(b) Write a program in *C* language to find the first 15 terms of Fibonacci sequence. 5

(c) Write a *C* program to find the GCD of two positive integers. 5

(d) Write a *C* program to find the sum $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{n}$. 5

(e) Write a program to check whether a number is prime or not (using break statement). 5

(f) Write a *C* program to check leap year. 5

3. Answer *any one* question: 10×1=10

(a) (i) Write a complete *C* program to calculate the following function for different argument values:

$$\left.\begin{aligned} f(x) &= x^2 + \text{Sin } 2x && \text{when } x < 3 \\ &= 10{\cdot}3 && \text{when } x = 3 \\ &= x^3 - \text{Cos } 3x && \text{when } x > 3 \end{aligned}\right\}.$$

(ii) What is the difference between local and global variable declaration? What is the purpose of using 'return' statement in *C* function subprogram? 6+2+2=10

(b) (i) Write a complete *C* program to display the maximum and minimum numbers from a series of numbers by using array variables.

(ii) What would be the output of the following program?

```
main()
{
  int i=4,j=-1,k=0,w,x,y,z;
  w=i||j||k;
  x=i&&j&&k;
  y=i||j&&k;
  z=i&&j||k;
  printf("\nw=%dx=%dy=%dz=%d", w,x,y,z);
}.
```

5+5=10

B.Sc. 3rd Semester (Honours) Examination, 2019-20

MATHEMATICS

Course ID : 32115 **Course Code : SHMTH-305/SEC-1**

Course Title: Logic and Sets

Time: 2 Hours **Full Marks: 40**

The figures in the right hand side margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

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1. Answer *any five* questions: 2×5=10

(a) Show that $R = \{(a, b): a \in \mathbb{Z},\ b \in \mathbb{Z},\ (a - b) \text{ is an even integer}\}$ is an equivalence relation on $\mathbb{Z}$.

(b) Show that $A = \{2,3,4,5\}$ is not a subset of $B = \{x: x \in \mathbb{N}, x \text{ is even}\}$.

(c) Find the elements of the set $A = \{\{1,2,3\}, \{4,5\}, \{5,7,8\}\}$.

(d) Determine the power set of $A = \{a, b, c, d\}$.

(e) Find the number of relations from $A = \{a, b, c\}$ to $B = \{1,2\}$.

(f) Prove that $(A \times B) \cap (A \times C) = A \times (B \cap C)$.

(g) Construct a truth table for the statement formula $\sim (\sim p \wedge q)$.

(h) Find the negation of the following quantified predicates: $(\exists x \in D)(x + 2 = 7)$.

2. Answer *any four* questions: 5×4=20

(a) It is known that in a university 60% of professors play tennis, 50% of them play bridge, 70% jog, 20% play tennis and bridge, 40% play bridge and jog and 30% play tennis and jog. If someone claimed that 20% professors jog and play tennis and bridge, would you believe his claim? Why? 5

(b) (i) Show that we can have $A \cap B = A \cap C$ without $B = C$

(ii) Prove that $(A \cup B) \setminus (A \cap B) = (A \setminus B) \cup (B \setminus A)$. 2+3=5

(c) Suppose $\mathbb{N} = \{1,2,3, \dots .\}$ is the universal set and

$A = \{x: x \leq 6\}, B = \{x: 4 \leq x \leq 9\}, C = \{1, 3, 5, 7, 9\}, D = \{2, 3, 5, 7, 8\}$.

Then find $A \cap B, B \cup C, A \cap (B \cup D), (A \cap B) \cup (A \cap D)$. 1+1+1+2=5

(d) If *R* be an equivalence relation on the set *A*, then show that R^{-1} is also an equivalence relation on *A*. 5

(e) (i) Construct a truth table for the statement form:

$$(p \wedge q) \vee \sim r.$$

(ii) Find the negation of the following statement:

$\exists x p(x) \wedge \exists\, y\, q\, (y)$. 3+2=5

(f) Construct the table for

(i) $(a \vee b) \leftrightarrow [((\sim a) \wedge c) \longrightarrow (b \wedge c)]$

(ii) $p \vee q$. 3+2=5

3. Answer *any one* question: 10×1=10

(a) In a class of 80 students, 50 students know English, 55 know French and 46 know German language. 37 students know English and French, 28 students know French and German. 7 students know none of the language. Find out

(i) How many students know all the three languages?

(ii) How many students know exactly two languages?

(iii) How many students know only one language? 3+3+4=10

(b) (i) Let *p, q, r* be statements. Then show that $p \vee (q \wedge r) = (p \vee q) \wedge (p \vee r)$ holds by truth table.

(ii) A relation ρ is defined on the set $\mathbb{Z}$ by "$a\rho b$ if and only if $ab > 0$" for $a, b \in \mathbb{Z}$. Examine if ρ is reflexive, symmetric and transitive.

(iii) Let ρ be a relation on a set *A*. Then prove that ρ is symmetric if and only if $\rho^{-1} = \rho$.

4+3+3=10