**International Islamic University, Islamabad (IIUI) Faculty of Basic and Applied Sciences (FBAS) Data Structures & Algorithms**

**Department of Computer Science**

**Assignment No. 1, June 2020 [Total Marks 25]**

**Instructor: Samreen Ishfaq**

**BSCS F18**

**Student Name: \_Mobeena\_Ramzan\_\_**

**Student Name: \_Noor-ul-Huda\_\_**

**Roll No: \_3868-FBAS/BSCS/F18\_\_**

**Roll No: \_3847-FBAS/BSCS/F18\_\_**

**This assignment is due on 8th June, 2020. This page will be the front page of your assignment, you have to write your group member names and registration numbers on it. Late submission is not acceptable.**

Convert the following infix expression into postfix expression using stack and evaluate it, show each step in tabular form.

1. **(((5^2) + (2\*2)) + (14/7))**
2. **34+5\*45/9+(64/8+5)+2**
3. **(2+4\*(7\*2) + ((4+6)/5))**
4. **(5\*5+6-7) + ((2^5 -8)\*9)**
5. **((10+5)\*(2+5)/(8-3)+(9/3)^(2\*2))**

**Question No 1:**  **(((5^2) + (2\*2)) + (14/7))**

|  |  |  |
| --- | --- | --- |
| **symb** | **Postfix** | **Stack** |
| **(** |  | ( |
| **(** |  | (( |
| **(** |  | ((( |
| **5** | 5 | ((( |
| **^** | 5 | (((^ |
| **2** | 5 2 | (((^ |
| **)** | 5 2^ | (( |
| **+** | 5 2^ | ((+ |
| **(** | 5 2^ | ((+( |
| **2** | 5 2^2 | ((+( |
| **\*** | 5 2^2 | ((+(\* |
| **2** | 5 2^2 2 | ((+(\* |
| **)** | 5 2^2 2\* | ((+ |
| **)** | 5 2^2 2\*+ | ( |
| **+** | 5 2^2 2\*+ | (+ |
| **(** | 5 2^2 2\*+ | (+( |
| **14** | 5 2^2 2\*+14 | (+( |
| **/** | 5 2^2 2\*+14 | (+(/ |
| **7** | 5 2^2 2\*+14 7 | (+(/ |
| **)** | 5 2^2 2\*+14 7/ | (+ |
| **)** | 5 2^2 2\*+14 7/+ |  |

**Postfix foam:** 5 2^2 2\*+14 7/+

**Evaluating Postfix:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Op1** | **Op2** | **value** | **stack** |
| **5** |  |  |  | 5 |
| **2** |  |  |  | 5,2 |
| **^** | 5 | 2 | 25 | 25 |
| **2** |  |  |  | 25,2 |
| **2** |  |  |  | 25,2,2 |
| **\*** | 2 | 2 | 4 | 25,4 |
| **+** | 25 | 4 | 29 | 29 |
| **14** |  |  |  | 29,14 |
| **7** |  |  |  | 29,14,7 |
| **/** | 14 | 7 | 2 | 29,2 |
| **+** | 29 | 2 | 31 | **31** |

**Result: 31.Question No 2:**  **34+5\*45/9+(64/8+5)+2**

|  |  |  |
| --- | --- | --- |
| **symb** | **Postfix** | **Stack** |
| **34** | 34 |  |
| **+** | 34 | + |
| **5** | 34 5 | + |
| **\*** | 34 5 | +\* |
| **45** | 34 5 45 | +\* |
| **/** | 34 5 45 \* | +/ |
| **9** | 34 5 45 \*9 | +/ |
| **+** | 34 5 45 \*9/+ | + |
| **(** | 34 5 45 \*9/+ | +( |
| **64** | 34 5 45 \*9/+64 | +( |
| **/** | 34 5 45 \*9/+64 | +(/ |
| **8** | 34 5 45 \*9/+64 8 | +(/ |
| **+** | 34 5 45 \*9/+64 8/ | +(+ |
| **5** | 34 5 45 \*9/+64 8/5 | +(+ |
| **)** | 34 5 45 \*9/+64 8/5+ | + |
| **+** | 34 5 45 \*9/+64 8/5+/ | + |
| **2** | 34 5 45 \*9/+64 8/5+/2 | + |
|  | 34 5 45 \*9/+64 8/5++/2+ |  |

**Postfix foam:** 34 5 45 \*9/+64 8/5++/2+

**Evaluating Postfix:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Op1** | **Op2** | **value** | **stack** |
| **34** |  |  |  | 34 |
| **5** |  |  |  | 34,5 |
| **45** |  |  |  | 35,5,45 |
| **\*** | 5 | 45 | 225 | 34,225 |
| **9** |  |  |  | 34,225,9 |
| **/** | 225 | 9 | 25 | 34,25 |
| **+** | 34 | 25 | 59 | 59 |
| **64** |  |  |  | 59,64 |
| **8** |  |  |  | 59,64,8 |
| **/** | 64 | 8 | 8 | 59,8 |
| **5** |  |  |  | 59,8,5 |
| **+** | 8 | 5 | 13 | 59,13 |
| **+** | 59 | 13 | 72 | 72 |
| **2** |  |  |  | 72,2 |
| **+** | 72 | 2 | 74 | **74** |

**Result: 74.**

**Question No 3:**  **(2+4\*(7\*2) + ((4+6)/5))**

|  |  |  |
| --- | --- | --- |
| **symb** | **Postfix** | **Stack** |
| **(** |  | ( |
| **2** | 2 | ( |
| **+** | 2 | (+ |
| **4** | 2 4 | (+ |
| **\*** | 2 4 | (+\* |
| **(** | 2 4 | (+\*( |
| **7** | 2 4 7 | (+\*( |
| **\*** | 2 4 7 | (+\*(\* |
| **2** | 2 4 7 2 | (+\*(\* |
| **)** | 2 4 7 2\* | (+\* |
| **+** | 2 4 7 2\*\*+ | (+ |
| **(** | 2 4 7 2\*\*+ | (+( |
| **(** | 2 4 7 2\*\*+ | (+(( |
| **4** | 2 4 7 2\*\*+4 | (+(( |
| **+** | 2 4 7 2\*\*+4 | (+((+ |
| **6** | 2 4 7 2\*\*+4 6 | (+((+ |
| **)** | 2 4 7 2\*\*+4 6+ | (+( |
| **/** | 2 4 7 2\*\*+4 6+ | (+(/ |
| **5** | 2 4 7 2\*\*+4 6+5 | (+(/ |
| **)** | 2 4 7 2\*\*+4 6+5/ | (+ |
| **)** | 2 4 7 2\*\*+4 6+5/+ |  |

**Postfix foam:** 2 4 7 2\*\*+4 6+5/+

**Evaluating Postfix:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Op1** | **Op2** | **value** | **stack** |
| **2** |  |  |  | 2 |
| **4** |  |  |  | 2,4 |
| **7** |  |  |  | 2,4,7 |
| **2** |  |  |  | 2,4,7,2 |
| **\*** | 7 | 2 | 14 | 2,4,14 |
| **\*** | 4 | 14 | 56 | 2,56 |
| **+** | 2 | 56 | 58 | 58 |
| **4** |  |  |  | 58,4 |
| **6** |  |  |  | 58,4,6 |
| **+** | 4 | 6 | 10 | 58,10 |
| **5** |  |  |  | 58,10,5 |
| **/** | 10 | 5 | 2 | 58,2 |
| **+** | 58 | 2 | 60 | **60** |

**Result: 60.Question No 4:**  **(5\*5+6-7) + ((2^5 -8)\*9)**

|  |  |  |
| --- | --- | --- |
| **symb** | **Postfix** | **Stack** |
| **(** |  | ( |
| **5** | 5 | ( |
| **\*** | 5 | (\* |
| **5** | 5 5 | (\* |
| **+** | 5 5\* | (+ |
| **6** | 5 5\*6 | (+ |
| **-** | 5 5\*6+ | (- |
| **7** | 5 5\*6+7 | (- |
| **)** | 5 5\*6+7- | (- |
| **+** | 5 5\*6+7- | + |
| **(** | 5 5\*6+7- | +( |
| **(** | 5 5\*6+7- | +(( |
| **2** | 5 5\*6+7-2 | +(( |
| **^** | 5 5\*6+7-2 | +((^ |
| **5** | 5 5\*6+7-2 5 | +((^ |
| **-** | 5 5\*6+7-2 5^ | +((- |
| **8** | 5 5\*6+7-2 5^8 | +((- |
| **)** | 5 5\*6+7-2 5^8- | +( |
| **\*** | 5 5\*6+7-2 5^8- | +(\* |
| **9** | 5 5\*6+7-2 5^8-9 | +(\* |
| **)** | 5 5\*6+7-2 5^8-9\* | + |
|  | 5 5\*6+7-2 5^8-9\*+ |  |

**Postfix foam:** 5 5\*6+7-2 5^8-9\*+

**Evaluating Postfix:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Op1** | **Op2** | **value** | **stack** |
| **5** |  |  |  | 5 |
| **5** |  |  |  | 5,5 |
| **\*** | 5 | 5 | 25 | 25 |
| **6** |  |  |  | 25,6 |
| **+** | 25 | 6 | 31 | 31 |
| **7** |  |  |  | 31,7 |
| **-** | 31 | 7 | 24 | 24 |
| **2** |  |  |  | 24,2 |
| **5** |  |  |  | 24,2,5 |
| **^** | 2 | 5 | 32 | 24,32 |
| **8** |  |  |  | 24,32,8 |
| **-** | 32 | 8 | 24 | 24,24 |
| **9** |  |  |  | 24,24,9 |
| **\*** | 24 | 9 | 216 | 24,216 |
| **+** | 24 | 216 | 240 | **240** |

**Result: 240.Question No 5:**  **((10+5)\*(2+5)/(8-3)+(9/3)^(2\*2))**

|  |  |  |
| --- | --- | --- |
| **symb** | **Postfix** | **Stack** |
| **(** |  | ( |
| **(** |  | (( |
| **10** | 10 | (( |
| **+** | 10 | ((+ |
| **5** | 10 5 | ((+ |
| **)** | 10 5+ | ( |
| **\*** | 10 5+ | (\* |
| **(** | 10 5+ | (\*( |
| **2** | 10 5+2 | (\*( |
| **+** | 10 5+2 | (\*(+ |
| **5** | 10 5+2 5 | (\*(+ |
| **)** | 10 5+2 5+ | (\* |
| **/** | 10 5+2 5+\* | (/ |
| **(** | 10 5+2 5+\* | (/( |
| **8** | 10 5+2 5+\*8 | (/( |
| **-** | 10 5+2 5+\*8 | (/(- |
| **3** | 10 5+2 5+\*8 3 | (/(- |
| **)** | 10 5+2 5+\*8 3- | (/ |
| **+** | 10 5+2 5+\*8 3-/ | (+ |
| **(** | 10 5+2 5+\*8 3-/ | (+( |
| **9** | 10 5+2 5+\*8 3-/9 | (+( |
| **/** | 10 5+2 5+\*8 3-/9 | (+(/ |
| **3** | 10 5+2 5+\*8 3-/9 3 | (+ |
| **)** | 10 5+2 5+\*8 3-/9 3/ | (+ |
| **^** | 10 5+2 5+\*8 3-/9 3/ | (+^ |
| **(** | 10 5+2 5+\*8 3-/9 3/ | (+^( |
| **2** | 10 5+2 5+\*8 3-/9 3/2 | (+^( |
| **\*** | 10 5+2 5+\*8 3-/9 3/2 | (+^(\* |
| **2** | 10 5+2 5+\*8 3-/9 3/2 2 | (+^(\* |
| **)** | 10 5+2 5+\*8 3-/9 3/2 2\* | (+^ |
| **)** | 10 5+2 5+\*8 3-/9 3/2 2\*^+ |  |

**Postfix foam:** 10 5+2 5+\*8 3-/9 3/2 2\*^+

**Evaluating Postfix:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Op1** | **Op2** | **value** | **stack** |
| **10** |  |  |  | 10 |
| **5** |  |  |  | 10,5 |
| **+** | 10 | 5 | 15 | 15 |
| **2** |  |  |  | 15,2 |
| **5** |  |  |  | 15,2,5 |
| **+** | 2 | 5 | 7 | 15,7 |
| **\*** | 15 | 7 | 105 | 105 |
| **8** |  |  |  | 105,8 |
| **3** |  |  |  | 105,8,3 |
| **-** | 8 | 3 | 21 | 21 |
| **/** | 105 | 5 | 21 | 21 |
| **9** |  |  |  | 21,9 |
| **3** |  |  |  | 21,9,3 |
| **/** | 9 | 3 | 3 | 21,3 |
| **2** |  |  |  | 21,3,2 |
| **2** |  |  |  | 21,3,2,2 |
| **\*** | 2 | 2 | 4 | 21,3,4 |
| **^** | 3 | 4 | 81 | 21,81 |
| **+** | 21 | 81 | 102 | **102** |

**Result: 102.**