**ABHINAV TYAGI (DESD HYD – 50330001)**

Q2. Evaluate the following Prefix Expressions.

**a. +,-,20,\*,3,4,1**

Solution:

Step1: Push 1 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 |  |  |  |

Step2: Push 4 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 4 |  |  |

Step3: Push 3 into stack

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 4 | 3 |  |

Step4: Pop 3 & 4 from the stack and use the operator \* as 3\*4 =12. Push 12 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 12 |  |  |

Step5: Push 20 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 12 | 20 |  |

Step6: As “-” operator comes again in the series. We will pop the elements 20 & 12 and will use the operator “-” as 20-12 =8. Push 8 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 8 |  |  |

Step7: As “+” operator comes again in the series. We will pop the elements 8 & 1 and will use the operator “-” as 8+1 =9. Push 9 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 9 |  |  |  |

b. **-, \*, 3, +, 3, 7, /, ^, 4, 2, 2**

Solution:

Step1: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 |  |  |  |

Step2: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 2 |  |  |

Step3: Push 4 into stack

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 2 | 4 |  |

Step4: Pop 2 & 4 from the stack and use the operator “^” as 4^2=16. Push 16 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 16 |  |  |

Step5: Pop 16 & 2 from the stack and use the operator “/” as 16/2=8. Push 8 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 8 |  |  |  |

Step6: Push 7 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 7 |  |  |

Step7: Push 3 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 7 | 3 |  |

Step8: As ‘+’ operator comes again in the series. We will pop the elements 3 & 7 and will use the operator “+” as 3+7 =10. Push 10 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 10 |  |  |

Step9: Push 3 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 10 | 3 |  |

Step9: As “\*” operator comes in the series. We will pop the elements 10 & 3 and will use the operator “\*” as 3\*10 =30. Push 30 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | 30 |  |  |

Step10: As “-” operator comes in the series. We will pop the elements 30& 8 and will use the operator “-” as 30-8 =22. Push 22 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 22 |  |  |  |

**c. -, /, \*, 3, ^, 5, 2, 15, -, 5, ^, 2, 2**

Solution:

Step1: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 |  |  |  |

Step2: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 2 |  |  |

Step3: As “^” operator comes in the series. We will pop the elements 2& 2 and will use the operator “^” as 2^2 =4. Push 4 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 4 |  |  |  |

Step4: Push 5 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 4 | 5 |  |  |

Step5: As “-” operator comes again in the series. We will pop the elements 5 & 4 and will use the operator “-” as 5-4 =1. Push 1 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 |  |  |  |

Step6: Push 15 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 15 |  |  |

Step7: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 15 | 2 |  |

Step8: Push 5 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 15 | 2 | 5 |

Step9: As “^” operator comes in the series. We will pop the elements 5 & 2 and will use the operator “^” as 5^2 =25. Push 25 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 15 | 25 |  |

Step10: Push 3 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 15 | 25 | 3 |

Step11: As “\*” operator comes in the series. We will pop the elements 3 & 25 and will use the operator “\*” as 3\*25 =75. Push 75 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 15 | 75 |  |

Step12: As “/” operator comes in the series. We will pop the elements 75 & 15 and will use the operator “/” as 75/15 =5. Push 5 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 5 |  |  |

Step13: As “-” operator comes in the series. We will pop the elements 5 & 1 and will use the operator “-” as 5-1 =4. Push 4 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 4 |  |  |  |

**d. +, -, +, /, \*, 2, 20, 2, \*, +, 3, 4, ^, 3, 2, 6, 15**

Solution:

Step1: Push 15 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 |  |  |  |

Step2: Push 6 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 6 |  |  |

Step3: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 6 | 2 |  |

Step4: Push 3 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 6 | 2 | 3 |

Step5: Pop 3 & 2 from the stack and use the operator “^” as 3^2 =9. Push 9 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 6 | 9 |  |

Step6: Push 4 into Stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 6 | 9 | 4 |

Step7: Push 3 into Stack.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 15 | 6 | 9 | 4 | 3 |

Step8: As “+” operator comes in the series. We will pop the elements 3 & 4 and will use the operator “+” as 3+4 =7. Push 7 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 6 | 9 | 7 |

Step9: As “\*” operator comes in the series. We will pop the elements 7& 9 and will use the operator “\*” as 7\*9 =63. Push 63 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 6 | 63 |  |

Step10: Push 2 into Stack.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 15 | 6 | 63 | 2 |  |

Step11: Push 20 into Stack.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 15 | 6 | 63 | 2 | 20 |

Step12: Push 2 into Stack.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 6 | 63 | 2 | 20 | 2 |

Step13: As “\*” operator comes in the series. We will pop the elements 2& 20 and will use the operator “\*” as 2\*20 =40. Push 40 into it.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 6 | 63 | 2 | 40 |  |

Step14: As “/” operator comes in the series. We will pop the elements 40& 2 and will use the operator “\*” as 40/2 =20. Push 20 into it.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 6 | 63 | 20 |  |  |

Step15: As “+” operator comes in the series. We will pop the elements 20& 63 and will use the operator “+” as 20+63 =83. Push 83 into it.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 6 | 83 |  |  |  |

Step16: As “-” operator comes in the series. We will pop the elements 83 & 6 and will use the operator “-” as 83-6 =77. Push 77 into it.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15 | 77 |  |  |  |  |

Step17: As “+” operator comes in the series. We will pop the elements 77& 15 and will use the operator “+” as 77+15 =92. Push 92 into it.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 92 |  |  |  |  |  |

**e. \*, 5, -, ^, 6, 2, 2**

Solution:

Step1: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 |  |  |  |

Step2: Push 2 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 2 |  |  |

Step3: Push 6 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 2 | 6 |  |

Step4: Pop 6 & 2 from the stack and use the operator ^ as 6^2 =36. Push 36 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 2 | 36 |  |  |

Step5: Pop 36 & 2 from the stack and use the operator “-” as 36-2 =34. Push 34 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 34 |  |  |  |

Step6: Push 5 into stack.

|  |  |  |  |
| --- | --- | --- | --- |
| 34 | 5 |  |  |

Step7: Pop 5 & 34 from the stack and use the operator “\*” as 5\*34 =170. Push 170 into it.

|  |  |  |  |
| --- | --- | --- | --- |
| 170 |  |  |  |