

Q. Translate the following infix expression into its equivalent postfix expression.

(i)  $(A+B)/D \wedge ((E-F)+G)$

(ii)  $A * (B+D)/E - F * (G+H/K)$

(iii)  $A + (B * C - (D/E \wedge F) * G) * H$

(iv)  $(A-B)/C * ((C-D/C + D))$

(v)  $(A+B) * D + E/(F+G+D)$

(20)

$$(A+B)/D \wedge ((E-F)+G)$$

Solution:  $\Rightarrow (A+B)/D \wedge ((E-F)+G)$

$$= \underline{AB} + /D \wedge ((E-F)+G)$$

$$= \underline{AB} + /D \wedge (\underline{EF} - +G)$$

$$= \underline{AB} + /D \wedge \underline{EF-G} +$$

$$= \underline{AB} + / \underline{DEF-G} + \wedge$$

$$= AB+DEF-G+\wedge/$$

$$A * (B+D)/E - F * (G+H/K)$$

Solution:  $\Rightarrow A * (B+D)/E - F * (G+H/K)$

$$= A * \underline{BD} + /E - F * (G+H/K)$$

$$= A * \underline{BD} + /E - F * (G + \underline{HK}/)$$

$$= A * \underline{BD} + /E - F * \underline{GHK}/ +$$

$$= \underline{ABD} + * /E - F * \underline{GHK}/ +$$

$$= \underline{ABD} + * E / - F * \underline{GHK}/ +$$

$$= \underline{ABD} + * E / - \underline{FGHK}/ + *$$

$$= ABD + * E / FGHK / + * - )$$

$$A + (B * C - (D / E \wedge F) * G) * H$$

Solution:  $\Rightarrow A + (B * C - (D / E \wedge F) * G) * H$

$$= A + (B * C - (D / \underline{E \wedge F}) * G) * H$$

$$= A + (B * C - \underline{DEF \wedge /} * G) * H$$

$$= A + (\underline{BC} * - \underline{DEF \wedge /} * G) * H$$

$$= A + (\underline{BC * - DEF \wedge / G *}) * H$$

$$= A + \underline{BC * DEF \wedge / G * -} * H$$

$$= A + \underline{BC * DEF \wedge / G * - H *}$$

$$= ABC * DEF \wedge / G * - H * +$$

$$(A - B) / C * ((C - D / C + D))$$

Solution:  $\Rightarrow (A - B) / C * ((C - D / C + D))$

$$= \underline{AB -} / C * ((C - D / C + D))$$

$$= \underline{AB -} / C * ((C - \underline{DC /} + D))$$

$$= \underline{AB -} / C * ((\underline{CDC / -} + D))$$

$$= \underline{AB -} / C * \underline{CDC / - D +}$$

$$= \underline{AB - C /} * \underline{CDC / - D +}$$

$$= AB - C / CDC / - D + *$$

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$$(A+B) * D + E / (F+G+D)$$

Solution  $\rightarrow (A+B) * D + E / (F+G+D)$

$$= \underline{AB} + * D + E / (F+G+D)$$

$$= \underline{AB} + * D + E / (\underline{FG} + + D)$$

$$= \underline{AB} + * D + E / \underline{FG+D+}$$

$$= \underline{AB+D} * + E / \underline{FG+D+}$$

$$= \underline{AB+D} * \underline{+EFG+D+}$$

$$= AB+D * EFG+D+ / +$$

Translate the following infix expression into its equivalent prefix expression.

- (i)  $(A+B)/D \wedge ((E-F)+G)$   
 (ii)  $A * (B+D)/E - F * (G+H/K)$   
 (iii)  $A + (B * C - (D/E \wedge F) * G) * H$   
 (iv)  $(A-B)/C * ((C-D)/(C+D))$   
 (v)  $(A+B) * D + E/(F+G+D)$

Soln

$$\begin{aligned}
 \text{(i)} \quad & (A+B)/D \wedge ((E-F)+G) \\
 = & \underline{+AB} / D \wedge ((E-F)+G) \\
 = & \underline{+AB} / D \wedge (\underline{-EF} + G) \\
 = & \underline{+AB} / D \wedge \underline{+-EFG} \\
 = & \underline{+AB} / \underline{\wedge D+-EFG} \\
 = & / \underline{+AB \wedge D+-EFG}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii)} \quad & A * (B+D)/E - F * (G+H/K) \\
 = & A * \underline{+BD} / E - F * (G + \underline{/HK}) \\
 = & A * \underline{+BD} / E - F * \underline{+G/HK} \\
 = & \underline{*A+BD} / E - F * \underline{+G/HK} \\
 = & \underline{/ *A+BDE} - F * \underline{+G/HK} \\
 = & \underline{/ *A+BDE} - \underline{*F+G/HK} \\
 = & - / *A+BDE * F + G/HK
 \end{aligned}$$



$$(iii) A + (B \vee C - (D/E \wedge F) \vee G) \vee H$$

$$= A + (B \vee C - (D/E \wedge EF) \vee G) \vee H$$

$$= A + (B \vee C - \underline{D \wedge EF} \vee G) \vee H$$

$$= A + (\underline{\neg BC} - \underline{D \wedge EF} \vee G) \vee H$$

$$= A + (\underline{\neg BC} - \underline{\neg D \wedge EFG}) \vee H$$

$$= A + \underline{\neg \neg BC \vee D \wedge EFG} \vee H$$

$$= A + \underline{\neg \neg BC \vee D \wedge EFG} H$$

$$= \neg A \vee \neg \neg BC \vee D \wedge EFG H$$

$$(iv) (A-B)/C \vee ((C-D)/C + D)$$

$$= \underline{\neg AB} / C \vee ((C-D)/C + D)$$

$$= \underline{\neg AB} / C \vee ((C - \underline{D/C} + D))$$

$$= \underline{\neg AB} / C \vee ((\underline{\neg C/D/C} + D))$$

$$= \underline{\neg AB} / C \vee \underline{\neg C/D/C D}$$

$$= \underline{\neg ABC} \vee \underline{\neg C/D/C D}$$

$$= \neg \neg ABC \vee \neg C/D/C D$$

$$\begin{aligned}
(V) \quad & (A+B) \times D + E / (F+G+D) \\
&= \underline{+AB} \times D + E / (F+G+D) \\
&= \underline{+AB} \times D + E / (\underline{+FG} + D) \\
&= \underline{+AB} \times D + E / \underline{++FGD} \\
&= \underline{\times +ABD} + E / \underline{++FGD} \\
&= \underline{\times +ABD} + \underline{/E++FGD} \\
&= \underline{+\times +ABD/E++FGD}.
\end{aligned}$$

Q Consider the expression

$$5 * (6 + 2) - (12 / 4)$$

Convert the above infix expression to postfix expression using stack.

Solution →

| Symbol | Scanned | Stack   | Postfix Expression         |
|--------|---------|---------|----------------------------|
| 5      |         |         | 5                          |
| *      |         | *       | 5                          |
| (      |         | *, (    | 5                          |
| 6      |         | *, (    | 5, 6                       |
| +      |         | *, (, + | 5, 6                       |
| 2      |         | *, (, + | 5, 6, 2                    |
| )      |         | +       | 5, 6, 2, +                 |
| -      |         | -       | 5, 6, 2, +, *              |
| (      |         | -, (    | 5, 6, 2, +, *              |
| 12     |         | -, (    | 5, 6, 2, +, *, 12          |
| /      |         | -, (, / | 5, 6, 2, +, *, 12          |
| 4      |         | -, (, / | 5, 6, 2, +, *, 12, 4       |
| )      |         | -       | 5, 6, 2, +, *, 12, 4, /    |
|        |         |         | 5, 6, 2, +, *, 12, 4, /, - |

∴ Postfix Expression is 5, 6, 2, +, \*, 12, 4, /, -



Q Convert  $A + (B * C - (D / E - F) * G) * H$  into postfix form showing stack status after every step in tabular form. (25)

| In | Symbol | Stack         | Postfix Expression                       |
|----|--------|---------------|--|
|    | A      |               | A  |
|    | +      | +             | A  |
|    | (      | +, (          | A  |
|    | B      | +, (          | A, B                                     |
|    | *      | +, (, *       | A, B                                     |
|    | C      | +, (, *       | A, B, C                                  |
|    | -      | +, (, -       | A, B, C, *                               |
|    | (      | +, (, -, (    | A, B, C, *                               |
|    | D      | +, (, -, (    | A, B, C, *, D                            |
|    | /      | +, (, -, (, / | A, B, C, *, D                            |
|    | E      | +, (, -, (, / | A, B, C, *, D, E                         |
|    | -      | +, (, -, (, - | A, B, C, *, D, E, /                      |
|    | F      | +, (, -, (, - | A, B, C, *, D, E, /, F                   |
|    | )      | +, (, -       | A, B, C, *, D, E, /, F, -                |
|    | *      | +, (, -, *    | A, B, C, *, D, E, /, F, -                |
|    | G      | +, (, -, *    | A, B, C, *, D, E, /, F, -, G             |
|    | )      | +             | A, B, C, *, D, E, /, F, -, G, *, -       |
|    | *      | +, *          | A, B, C, *, D, E, /, F, -, G, *, -       |
|    | H      | +, *          | A, B, C, *, D, E, /, F, -, G, *, - H     |
|    |        |               | A, B, C, *, D, E, /, F, -, G, *, -, H, + |

∴ Postfix Expression is  $ABC * DE / F - G * H * +$

26) Q Consider the following infix expression:

$$((A+B)*D)^(E-F)$$

Find its equivalent postfix expression using stack.

| Symbol | Stack | Expression        |
|--------|-------|-------------------|
| (      | (     |                   |
| (      | ((    |                   |
| A      | ((    | A                 |
| +      | ((,+  | A                 |
| B      | ((,+  | A,B               |
| )      | (     | A,B,+             |
| *      | (,*   | A,B,+             |
| D      | (,*,D | A,B,+,D           |
| )      | Empty | A,B,+,D,*         |
| ^      | ^     | A,B,+,D,*         |
| (      | ^,(   | A,B,+,D,*,        |
| E      | ^,(   | A,B,+,D,*,E       |
| -      | ^,(-  | A,B,+,D,*,E       |
| F      | ^,(-  | A,B,+,D,*,E,F     |
| )      | ^     | A,B,+,D,*,E,F,-   |
|        | Empty | A,B,+,D,*,E,F,-,^ |

∴ Postfix Expression is A,B,+,D,\*,E,F,-,^

Q Convert following infix to Postfix Expression  $\Rightarrow$   
 $A + B / C * (D + E) - F$

Solution  $\Rightarrow$

| Symbol | Stack      | Postfix Expression              |
|--------|------------|---------------------------------|
| A      | Empty      | A                               |
| +      | +          | A                               |
| B      | +          | A, B                            |
| /      | +, /       | A, B                            |
| C      | +, /       | A, B, C                         |
| *      | +, *       | A, B, C, /                      |
| (      | +, *, (    | A, B, C, /                      |
| D      | +, *, (    | A, B, C, /, D                   |
| +      | +, *, (, + | A, B, C, /, D                   |
| E      | +, *, (, + | A, B, C, /, D, E                |
| )      | +, *       | A, B, C, /, D, E, +             |
| -      | -          | A, B, C, /, D, E, +, *, +       |
| F      | -          | A, B, C, /, D, E, +, *, +, F    |
|        | Empty      | A, B, C, /, D, E, +, *, +, F, - |

$\therefore$  Postfix Expression is  $ABC/DE++F-$

Q Convert the following infix to Postfix Expression:  
 $A \wedge B * C / (D * E - F)$

Solution

| Symbol   | Stack    | Postfix Expression                      |
|----------|----------|---|
| A        | Empty    | A                                       |
| $\wedge$ | $\wedge$ | A                                       |
| B        | $\wedge$ | A, B                                    |
| *        | *        | A, B, $\wedge$                          |
| C        | *        | A, B, $\wedge$ , C                      |
| /        | /        | A, B, $\wedge$ , C, *                   |
| (        | /, (     | A, B, $\wedge$ , C, *                   |
| D        | /, (     | A, B, $\wedge$ , C, *, D                |
| *        | /, (, *  | A, B, $\wedge$ , C, *, D                |
| E        | /, (, *  | A, B, $\wedge$ , C, *, D, E             |
| -        | /, (, -  | A, B, $\wedge$ , C, *, D, E, *          |
| F        | /, (, -  | A, B, $\wedge$ , C, *, D, E, *, F       |
| )        | /        | A, B, $\wedge$ , C, *, D, E, *, F, -    |
|          | Empty    | A, B, $\wedge$ , C, *, D, E, *, F, -, / |



Q. Convert following infix expression to postfix expression. (27)  
 $A - B / C \wedge D * E + F / G$

Solution:-

| Symbol | Stack   | Postfix Expression                    |
|--------|---------|---------------------------------------|
| A      | Empty   | A                                     |
| -      | -       | A                                     |
| B      | -       | A, B                                  |
| /      | -, /    | A, B                                  |
| C      | -, /    | A, B, C                               |
| ^      | -, /, ^ | A, B, C                               |
| D      | -, /, ^ | A, B, C, D                            |
| *      | -, *    | A, B, C, D, ^, /                      |
| E      | -, *    | A, B, C, D, ^, /, E                   |
| +      | +       | A, B, C, D, ^, /, E, *, -             |
| F      | +       | A, B, C, D, ^, /, E, *, -, F          |
| /      | +, /    | A, B, C, D, ^, /, E, *, -, F          |
| G      | +, /    | A, B, C, D, ^, /, E, *, -, F, G       |
|        | Empty   | A, B, C, D, ^, /, E, *, -, F, G, /, + |

$\therefore$  Postfix Expression is:  $ABCD \wedge / E * - F G / +$



Q Convert given infix expression to postfix expression.  
 $8 * (5^4 + 2) - 6^2 / (9 * 3)$

Soln

| Symbol | Stack      | Postfix Expression                          |
|--------|------------|---|
| 8      | Empty      | 8   |
| *      | *          | 8   |
| (      | *, (       | 8   |
| 5      | *, (       | 8, 5  |
| ^      | *, (, ^    | 8, 5  |
| 4      | *, (, ^    | 8, 5, 4                                     |
| +      | *, (, +    | 8, 5, 4, ^                                  |
| 2      | *, (, +    | 8, 5, 4, ^, 2                               |
| )      | *          | 8, 5, 4, ^, 2, +                            |
| -      | -          | 8, 5, 4, ^, 2, +, *                         |
| 6      | -          | 8, 5, 4, ^, 2, +, *, 6                      |
| ^      | -, ^       | 8, 5, 4, ^, 2, +, *, 6                      |
| 2      | -, ^       | 8, 5, 4, ^, 2, +, *, 6, 2                   |
| /      | -, /       | 8, 5, 4, ^, 2, +, *, 6, 2, ^                |
| (      | -, /, (    | 8, 5, 4, ^, 2, +, *, 6, 2, ^                |
| 9      | -, /, (    | 8, 5, 4, ^, 2, +, *, 6, 2, ^, 9             |
| *      | -, /, (, * | 8, 5, 4, ^, 2, +, *, 6, 2, ^, 9             |
| 3      | -, /, (, * | 8, 5, 4, ^, 2, +, *, 6, 2, ^, 9, 3          |
| )      | -, /       | 8, 5, 4, ^, 2, +, *, 6, 2, ^, 9, 3, *       |
|        | Empty      | 8, 5, 4, ^, 2, +, *, 6, 2, ^, 9, 3, *, /, - |

∴ Postfix Expression =  $8, 5, 4, ^, 2, +, *, 6, 2, ^, 9, 3, *, /, -$

Q Convert given infix expression to postfix expression. (2)

Soln

$$7 + 5 * 3 ^ 2 / (9 - 2 ^ 2) + 6 * 4$$

| Symbol | Stack      | Postfix Expression                                |
|--------|------------|---|
| 7      |            | 7   |
| +      | +          | 7   |
| 5      | +          | 7, 5  |
| *      | +, *       | 7, 5  |
| 3      | +, *       | 7, 5, 3   |
| ^      | +, *, ^    | 7, 5, 3   |
| 2      | +, *, ^    | 7, 5, 3, 2  |
| /      | +, /       | 7, 5, 3, 2, ^, *                                  |
| (      | +, /       | 7, 5, 3, 2, ^, *                                  |
| 9      | +, /       | 7, 5, 3, 2, ^, *, 9                               |
| -      | +, /, -    | 7, 5, 3, 2, ^, *, 9                               |
| 2      | +, /, -    | 7, 5, 3, 2, ^, *, 9, 2                            |
| ^      | +, /, -, ^ | 7, 5, 3, 2, ^, *, 9, 2                            |
| 2      | +, /, -, ^ | 7, 5, 3, 2, ^, *, 9, 2, 2                         |
| )      | +, /       | 7, 5, 3, 2, ^, *, 9, 2, 2, ^, -                   |
| +      | +          | 7, 5, 3, 2, ^, *, 9, 2, 2, ^, -, /, +             |
| 6      | +          | 7, 5, 3, 2, ^, *, 9, 2, 2, ^, -, /, +, 6          |
| *      | +, *       | 7, 5, 3, 2, ^, *, 9, 2, 2, ^, -, /, +, 6          |
| 4      | +, *       | 7, 5, 3, 2, ^, *, 9, 2, 2, ^, -, /, +, 6, 4       |
|        |            | 7, 5, 3, 2, ^, *, 9, 2, 2, ^, -, /, +, 6, 4, *, + |

∴ Postfix Expression is  $7532^{\wedge} * 922^{\wedge} - / + 64 * +$

Q. Evaluate the postfix expression 5 6 2 + \* 12 4 / -  
using stack.

Soln

| Symbol | Stack     | Postfix Expression (B op A)      |
|--------|-----------|----------------------------------|
| 5      | 5         |                                  |
| 6      | 5, 6      |                                  |
| 2      | 5, 6, 2   |                                  |
| +      | 5, 8      | $[6 + 2] \quad (A = 2, B = 6)$   |
| *      | 40        | $[5 * 8] \quad (A = 8, B = 5)$   |
| 12     | 40, 12    |                                  |
| 4      | 40, 12, 4 |                                  |
| /      | 40, 3     | $[12 / 4] \quad (A = 4, B = 12)$ |
| -      | 37        | $[40 - 3] \quad (A = 3, B = 40)$ |

∴ Answer = 37.

Q3) Evaluate  $12 \ 7 \ 3 \ - \ / \ 2 \ 1 \ 5 \ + \ 4 \ +$  using stack.

| Symbol | Stack      | Operation (B op A)           |
|--------|------------|------------------------------|
| 12     | 12         |                              |
| 7      | 12, 7      |                              |
| 3      | 12, 7, 3   |                              |
| -      | 12, 4      | $[7 - 3] \ (A = 3, B = 7)$   |
| /      | 3          | $[12 - 4] \ (A = 4, B = 12)$ |
| 2      | 3, 2       |                              |
| 1      | 3, 2, 1    |                              |
| 5      | 3, 2, 1, 5 |                              |
| +      | 3, 2, 6    | $[1 + 5] \ (A = 5, B = 1)$   |
| 4      | 3, 12      | $[2 + 6] \ (A = 6, B = 2)$   |
| +      | 15         | $[3 + 12] \ (A = 12, B = 3)$ |

$\therefore$  Answer = 15

Q Evaluate  $7\ 5\ 3\ 2\ \wedge\ 4\ 9\ 2\ 2\ \wedge\ -\ /\ +\ 6\ 4\ 4\ +$  (34)  
using stack.

| Symbol   | Stack          | Operation (B op A)        |
|----------|----------------|---------------------------|
| 7        | 7              |                           |
| 5        | 7, 5           |                           |
| 3        | 7, 5, 3        |                           |
| 2        | 7, 5, 3, 2     |                           |
| $\wedge$ | 7, 5, 9        | $[3 \wedge 2] (A=2, B=3)$ |
| 4        | 7, 45          | $[5 * 9] (A=9, B=5)$      |
| 9        | 7, 45, 9       |                           |
| 2        | 7, 45, 9, 2    |                           |
| 2        | 7, 45, 9, 2, 2 |                           |
| $\wedge$ | 7, 45, 9, 4    | $[2 \wedge 2] (A=2, B=2)$ |
| -        | 7, 45, 5       | $[9 - 4] (A=4, B=9)$      |
| /        | 7, 9           | $[45 / 5] (A=5, B=45)$    |
| +        | 16             | $[7 + 9] (A=9, B=7)$      |
| 6        | 16, 6          |                           |
| 4        | 16, 6, 4       |                           |
| *        | 16, 24         | $[6 * 4] (A=4, B=6)$      |
| +        | 40             | $[16 + 24] (A=24, B=16)$  |

$\therefore$  Answer = 40



Q Evaluate  $5\ 9\ 3\ /\ 2\ 1\ +\ *\ +\ 6\ 2\ /\ -\ 3\ +$  using stack.

| Symbol | Stack      | Operation (B op A)       |
|--------|------------|--------------------------|
| 5      | 5          |                          |
| 9      | 5, 9       |                          |
| 3      | 5, 9, 3    |                          |
| /      | 5, 3       | $[9\ /\ 3] (A=3, B=9)$   |
| 2      | 5, 3, 2    |                          |
| 1      | 5, 3, 2, 1 |                          |
| +      | 5, 3, 3    | $[2\ +\ 1] (A=1, B=2)$   |
| *      | 5, 9       | $[3\ *\ 3] (A=3, B=3)$   |
| +      | 14         | $[5\ +\ 9] (A=9, B=5)$   |
| 6      | 14, 6      |                          |
| 2      | 14, 6, 2   |                          |
| /      | 14, 3      | $[6\ /\ 2] (A=2, B=6)$   |
| -      | 11         | $[14\ -\ 3] (A=3, B=14)$ |
| 3      | 11, 3      |                          |
| +      | 14         | $[11\ +\ 3] (A=3, B=11)$ |

∴ Answer = 14

Q Evaluate  $7\ 5\ 3\ 2\ \wedge\ 4\ 9\ 2\ 2\ \wedge\ -\ /\ +\ 6\ 4\ 4\ +$  (34)  
using stack.

| Symbol   | Stack          | Operation (B op A)        |
|----------|----------------|---------------------------|
| 7        | 7              |                           |
| 5        | 7, 5           |                           |
| 3        | 7, 5, 3        |                           |
| 2        | 7, 5, 3, 2     |                           |
| $\wedge$ | 7, 5, 9        | $[3 \wedge 2] (A=2, B=3)$ |
| 4        | 7, 45          |                           |
| 9        | 7, 45, 9       | $[5 \neq 9] (A=9, B=5)$   |
| 2        | 7, 45, 9, 2    |                           |
| 2        | 7, 45, 9, 2, 2 |                           |
| $\wedge$ | 7, 45, 9, 4    | $[2 \wedge 2] (A=2, B=2)$ |
| -        | 7, 45, 5       | $[9 - 4] (A=4, B=9)$      |
| /        | 7, 9           | $[45 / 5] (A=5, B=45)$    |
| +        | 16             | $[7 + 9] (A=9, B=7)$      |
| 6        | 16, 6          |                           |
| 4        | 16, 6, 4       |                           |
| $\neq$   | 16, 24         | $[6 \neq 4] (A=4, B=6)$   |
| +        | 40             | $[16 + 24] (A=24, B=16)$  |

$\therefore$  Answer = 40

Q Evaluate  $4\ 3\ 2\ \wedge + 1\ 8\ * 2\ 2\ + / - 2 -$  using stack. (35)

| Symbol   | Stack       | Operation (B op A)        |
|----------|-------------|---------------------------|
| 4        | 4           |                           |
| 3        | 4, 3        |                           |
| 2        | 4, 3, 2     |                           |
| $\wedge$ | 4, 9        | $[3 \wedge 2] (A=2, B=3)$ |
| +        | 13          | $[4 + 9] (A=9, B=4)$      |
| 1        | 13, 1       |                           |
| 8        | 13, 1, 8    |                           |
| *        | 13, 8       | $[1 * 8] (A=8, B=1)$      |
| 2        | 13, 8, 2    |                           |
| 2        | 13, 8, 2, 2 |                           |
| +        | 13, 8, 4    | $[2 + 2] (A=2, B=2)$      |
| /        | 13, 2       | $[8 / 4] (A=4, B=8)$      |
| -        | 11          | $[13 - 2] (A=2, B=13)$    |
| 2        | 11, 2       |                           |
| -        | 9           | $[11 - 2] (A=2, B=11)$    |

$\therefore$  Answer = 9

Q Evaluate  $2\ 3\ \wedge\ 1\ -\ 4\ 2\ /\ 6\ *\ +\ 3\ 1\ +\ 2\ /\ -$   
using stack.

Soln

| Symbol   | Stack    | Operation (B op A)           |
|----------|----------|------------------------------|
| 2        | 2        |                              |
| 3        | 2, 3     |                              |
| $\wedge$ | 8        | $[2\ \wedge\ 3]\ (A=3, B=2)$ |
| 1        | 8, 1     |                              |
| -        | 7        | $[8-1]\ (A=1, B=8)$          |
| 4        | 7, 4     |                              |
| 2        | 7, 4, 2  |                              |
| /        | 7, 2     | $[4/2]\ (A=2, B=4)$          |
| 6        | 7, 2, 6  |                              |
| *        | 7, 12    | $[2*6]\ (A=6, B=2)$          |
| +        | 19       | $[7+12]\ (A=12, B=7)$        |
| 3        | 19, 3    |                              |
| 1        | 19, 3, 1 |                              |
| +        | 19, 4    | $[3+1]\ (A=1, B=3)$          |
| 2        | 19, 4, 2 |                              |
| /        | 19, 2    | $[4/2]\ (A=2, B=4)$          |
| -        | 17       | $[19-2]\ (A=2, B=19)$        |

$\therefore \text{Ans} = 17$

Q Convert infix Expression  $2 * 3 / (2 - 1) + 5 * (4 - 1)$  into prefix form using stack.

Soln Infix =  $2 * 3 / (2 - 1) + 5 * (4 - 1)$

Reversed Expression:  $) 1 - 4 ( * 5 + ) 1 - 2 ( / 3 * 2$

| Symbol | Stack   | Prefix Expression (Right to Left)     |
|--------|---------|---------------------------------------|
| )      | )       |                                       |
| 1      | )       | 1                                     |
| -      | ), -    | 1                                     |
| 4      | ), -    | 1, 4                                  |
| (      | Empty   | 1, 4, -                               |
| *      | *       | 1, 4, -                               |
| 5      | *       | 1, 4, -, 5                            |
| +      | +       | 1, 4, -, 5, +                         |
| )      | +, )    | 1, 4, -, 5, +                         |
| 1      | +, )    | 1, 4, -, 5, +, 1                      |
| -      | +, ), - | 1, 4, -, 5, +, 1                      |
| 2      | +, ), - | 1, 4, -, 5, +, 1, 2                   |
| (      | +       | 1, 4, -, 5, +, 1, 2, -                |
| /      | +, /    | 1, 4, -, 5, +, 1, 2, -                |
| 3      | +, /    | 1, 4, -, 5, +, 1, 2, -, 3             |
| *      | +, /, * | 1, 4, -, 5, +, 1, 2, -, 3             |
| 2      | +, /, * | 1, 4, -, 5, +, 1, 2, -, 3, 2          |
|        | Empty   | 1, 4, -, 5, +, 1, 2, -, 3, 2, +, /, + |

Reverse output string:  $+ / * 2 3 - 2 1 * 5 - 4 1$

∴ Prefix Expression is  $+ / * 2 3 - 2 1 * 5 - 4 1$



Q Convert given infix expression to prefix expression using Stack.  $(8+2)/2 * 3 - 2/1 + 3$

Soln Infix Expression :  $(8+2)/2 * 3 - 2/1 + 3$

Reverse infix Expression :  $3 + 1/2 - 3 * 2/1 ) 2 + 8 ($

| Symbol | Stack            | Prefix Expression (Right to Left)     |
|--------|------------------|---------------------------------------|
| 3      | Empty            | 3                                     |
| +      | +                | 3                                     |
| 1      | +                | 3, 1                                  |
| /      | +, /             | 3, 1                                  |
| 2      | +, /             | 3, 1, 2                               |
| -      | +, -             | 3, 1, 2, /                            |
| 3      | +, -             | 3, 1, 2, /, 3                         |
| *      | +, -, *          | 3, 1, 2, /, 3                         |
| 2      | +, -, *          | 3, 1, 2, /, 3, 2                      |
| /      | +, -, *, /       | 3, 1, 2, /, 3, 2                      |
| )      | +, -, *, /, )    | 3, 1, 2, /, 3, 2                      |
| 2      | +, -, *, /, )    | 3, 1, 2, /, 3, 2, 2                   |
| +      | +, -, *, /, ), + | 3, 1, 2, /, 3, 2, 2                   |
| 8      | +, -, *, /, ), + | 3, 1, 2, /, 3, 2, 2, 8                |
| (      | +, -, *, /       | 3, 1, 2, /, 3, 2, 2, 8, +             |
|        | Empty            | 3, 1, 2, /, 3, 2, 2, 8, +, /, *, -, + |

Reverse output string :  $+, -, *, /, +, 8, 2, 2, 3, /, 2, 1, 3$

$\therefore$  Prefix Expression :  $+, -, *, /, +, 8, 2, 2, 3, /, 2, 1, 3$

Q Convert following infix expression to equivalent prefix expression using stack.

$$A - (B + C) * D / E$$

Soln Infix Expression:  $A - (B + C) * D / E$

Reversed Infix Expression:  $E / D * ) C + B ( - A$

| Symbol | Stack      | Prefix Expression (Right-to-Left) |
|--------|------------|-----------------------------------|
| E      | Empty      | E                                 |
| /      | /          | E                                 |
| D      | /          | E, D                              |
| *      | /, *       | E, D                              |
| )      | /, *, )    | E, D                              |
| C      | (, *, )    | E, D, C                           |
| +      | (, *, ), + | E, D, C                           |
| B      | (, *, ), + | E, D, C, B                        |
| (      | (, *       | E, D, C, B, +                     |
| -      | -          | E, D, C, B, +, *, /               |
| A      | -          | E, D, C, B, +, *, /, A            |
|        | Empty      | E, D, C, B, +, *, /, A, -         |

Reverse Output Expression:  $-, A, /, *, +, B, C, D, E$

Prefix Expression:  $-, A, /, *, +, B, C, D, E$

Q Convert following infix expression to prefix expression using stack.

$$H \wedge (J + K) * I \% S$$

Soln Prefix Expression:  $H \wedge (J + K) * I \% S$

Reverse Prefix Expression:  $S \% I * ) K + J ( \wedge H$

| Symbol | Stack      | Prefix Expression (Right-to-left) |
|--------|------------|-----------------------------------|
| S      |            | S                                 |
| %      | %          | S                                 |
| I      | %          | S I                               |
| *      | %, *       | S, I                              |
| )      | %, *, )    | S, I                              |
| K      | %, *, )    | S, I, K                           |
| +      | %, *, ), + | S, I, K                           |
| J      | %, *, ), + | S, I, K, J                        |
| (      | %, *       | S, I, K, J, +                     |
| ^      | %, *, ^    | S, I, K, J, +                     |
| H      | %, *, ^    | S, I, K, J, +, H                  |
|        |            | S, I, K, J, +, H, ^, *, %         |

Reverse Output Expression:  $\%, *, ^, H, +, J, K, I, S$

Prefix Expression:  $\% \wedge H + J K I S$