

CS & IT ENGINEERING



Data Structures

Stacks *and Queues*

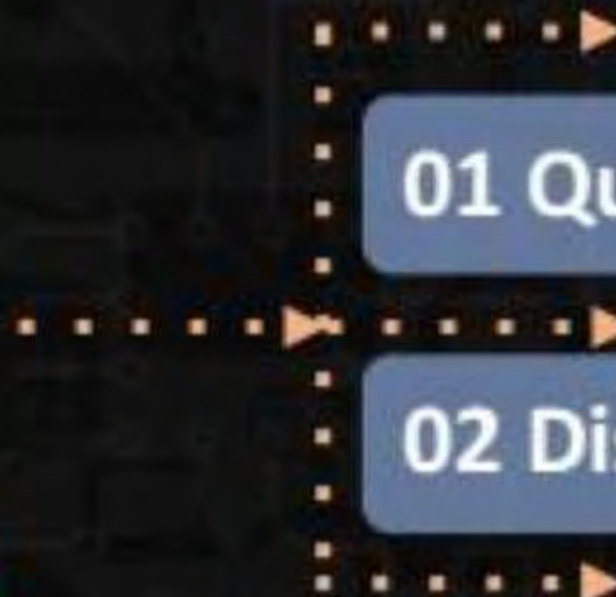
DPP 02 *Discussion Notes*



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TOPICS TO BE COVERED



01 Question

02 Discussion

Q.1

Consider the following infix expression:

$$P-Q/(R*S)+T*U$$

The prefix notation of the given expression is-

A $-+P/Q*RS*TU$

☒ **B** $+ -P/Q*RS*TU$

C $+ -/PQ*RS*TU$

D None of the above.

(B)

$$+ -P/Q*RS*TU$$

$$P-Q/(R \times S)+T \times U$$

[MCQ]

$$P-Q/[\times RS]+T \times U$$

$$P-[/Q \times RS]+T \times U$$

$$P-[/Q \times RS]+[\times TU]$$

$$[-P/Q \times RS]+[\times TU]$$



Q.2

Consider the following expression:

$$P + Q/R - S * T^U / V - W$$

$$PQR/+STU^*V/-W-$$

The post fix notation of the given expression is-

[MCQ]

☒ A $PQR/+STU^*V/-W-$

☐ B $PQ+RS-TU^*V/-W-$

☐ C $PQR/-STU^*V/W+-$

☐ D None of the above

$$\begin{aligned} &P + Q/R - S * T^U / V - W \\ &\quad \quad \quad \downarrow \\ &P + Q/R - S * [T^U] / V - W \\ &\quad \quad \quad \downarrow \\ &P + [Q/R] - S * [T^U] / V - W \end{aligned}$$

$$\begin{aligned} &P + [Q/R] - [STU^*] / V - W \\ &\quad \quad \quad \downarrow \\ &P + [Q/R] - [STU^*V/] - W \\ &\quad \quad \quad \downarrow \\ &[PQR/+] - [STU^*V/] - W \\ &\quad \quad \quad \downarrow \\ &[PQR/+STU^*V/-] - W \end{aligned}$$

Q.3

Consider the following prefix notation:
 $/^{\wedge} * + abc / de^{\wedge} gh$

$$((a+b)*c)^{\wedge}(d/e) / (g^{\wedge}h)$$



The postfix notation of the given expression is-

[MCQ]

B $ab+c*de/^{\wedge}gh^{\wedge}/$

A $abc+*de/^{\wedge}gh^{\wedge}/$

C $abc+de/*^{\wedge}gh^{\wedge}/$

D None of the above

Handwritten conversion steps for the prefix expression $/^{\wedge} * + abc / de^{\wedge} gh$:

$$\begin{aligned} & /^{\wedge} * + abc / de^{\wedge} gh \\ & /^{\wedge} * + abc (de)^{\wedge} gh \\ & /^{\wedge} * (+ab)c (d/e) (g^{\wedge}h) \end{aligned}$$

Handwritten conversion steps for the prefix expression $((a+b)*c)^{\wedge}(d/e) / (g^{\wedge}h)$:

$$\begin{aligned} & /^{\wedge} * (a+b), c, d/e, g^{\wedge}h \\ & /, ^{\wedge}, (a+b)*c, d/e, g^{\wedge}h \\ & /, [(a+b)*c]^{\wedge}(d/e), g^{\wedge}h \end{aligned}$$

Q.3

Consider the following prefix notation:
 $/^*+abc/de^gh$

The postfix notation of the given expression is-

$$\frac{((a+b)*c)^{(d/e)}}{(g^h)}$$

$[ab+]*c$

$$\frac{([ab+c]^x)^{(d/e)}}{(g^h)}$$

[MCQ]

☒ B $ab+c*de/^gh^/$

☐ A $abc+*de/^gh^/$

☐ C $abc+de/*^gh^/$

☐ D None of the above

$$\frac{[ab+c*de/^]}{(g^h)}$$
$$[ab+c*de/^]/[g^h]$$

Q.4

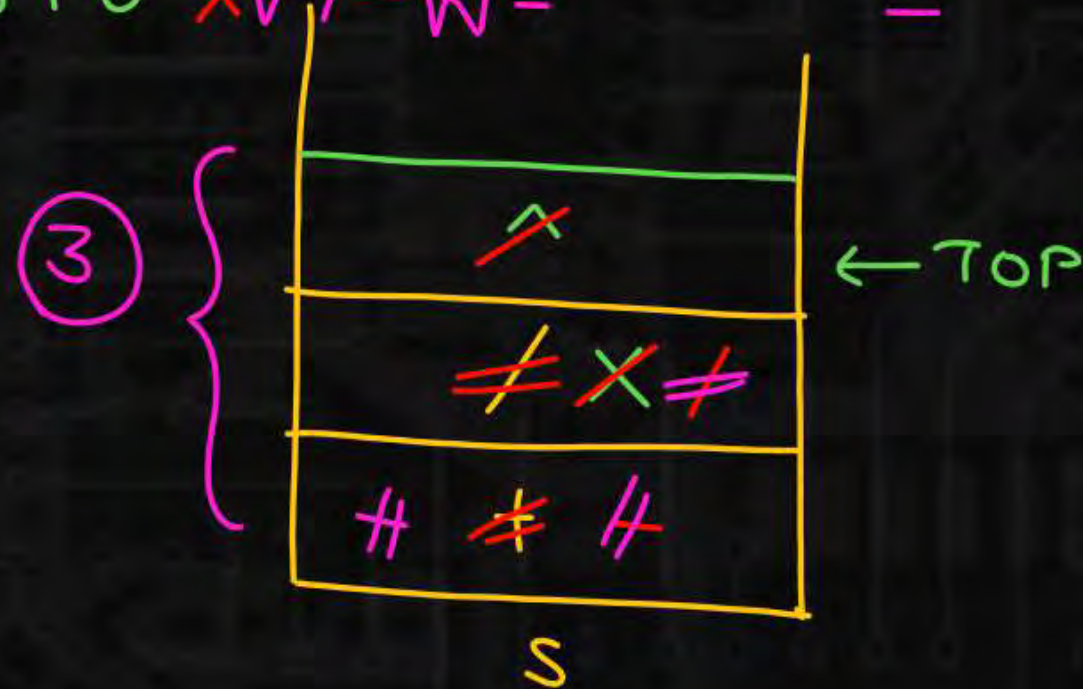
Consider the following infix expression:
 $P+Q/R-S*T^U/V-W$

The maximum size of the operator stack required to convert the given infix to postfix notation is 3.

[NAT]

infix: $P+Q/R-S\times T^U/V-W$ Ends

o/p: $PQR/+STU^XV/-W-$



Q.5

Consider the following infix expression:

$P*Q/R-S*T+U/V*W$

On reaching the symbol V, the top two contents of the operator stack are:

A $/, *$

B $/, -$

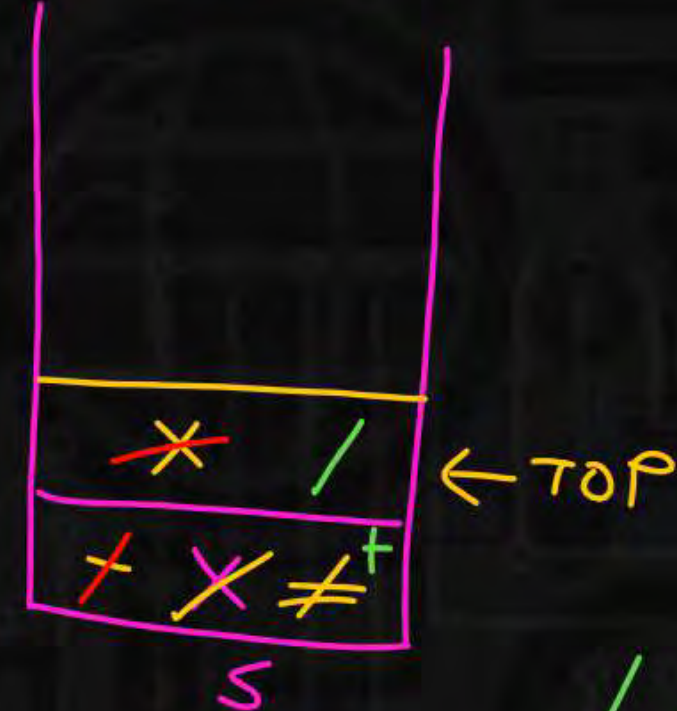
C $*, +$

☒ D $/, +$

[MCQ]

i/p: $P \times Q / R - S \times T + U / V \times W$

o/p: $PQ \times R / ST \times - UV$



$/, +$

Q.6

Consider the following postfix expression:

$8\ 2\ 3\ /\ 5\ 3\ *\ 2\ 1\ /\ -$

The result of evaluating the above postfix expression is 14.

[NAT]

$8\ 2\ 3\ /\ 5\ 3\ *\ 2\ 1\ /\ -$

$(8\ 2\ /)\ 5\ 3\ *\ 2\ 1\ /\ -$

$1\ (5\ 3\ *)\ +\ 2\ 1\ /\ -$

$1\ 15\ +\ 2\ 1\ /\ -$

$16\ (2\ 1\ /\ -)$
 $16\ 2\ -$

(14)

Q.7



Let X be the result when the below postfix expression is evaluated:

$$X = 8 \ 3 \ 1 + - \ 2 \wedge 7 \ 1 \ 2 - * +$$

And Y be the result of the following postfix expression:

$$Y = X \ 3 / 4 +$$

The value of $(X+Y)0.5$ is 4

$$Y = (9 \ 3 /) 4 +$$

[NAT]

$$8 \ (3 \ 1 +) - \ 2 \wedge 7 \ 1 \ 2 - * +$$

$$(8 \ 4 -) \ 2 \wedge 7 \ 1 \ 2 - * +$$

$$(4 \ 2 \wedge) \ 7 \ 1 \ 2 - * +$$

$$16 \ 7 \ (1 \ 2 -) * +$$

$$16 \ 7 \ (-1) * +$$

$$16 \ -7 +$$

$$(9)$$

$$Y = 7$$

$$X = 9$$

$$16^{1/2} = 4$$

Q.8

Let X be the result when the below postfix expression is evaluated:

$X = 4\ 5\ 1\ +\ * \ 2\ /\ 3\ 1\ 2\ +\ *\ +$ End

Let Y be the maximum size of the operand stack, the value of X-Y is _____

[NAT]

$X = 21$
 $Y = 4$
 $21 - 4 = 17$

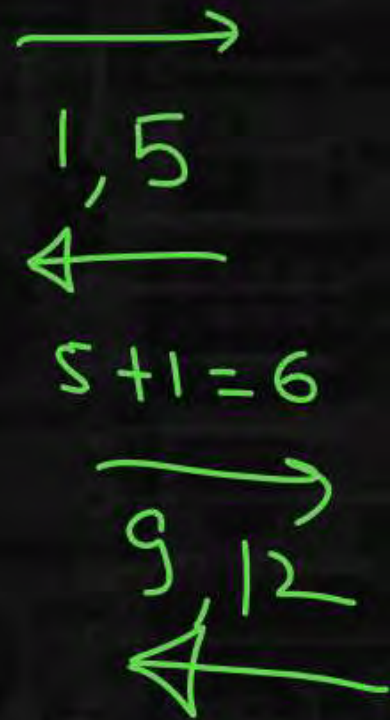


Diagram illustrating the evaluation of the postfix expression $4\ 5\ 1\ +\ * \ 2\ /\ 3\ 1\ 2\ +\ *\ +$ using a stack. The stack grows downwards (increasing index).

- Initial state: Stack contains 1, 5. Index 1, 5.
- Operation $+$: Stack becomes 1, 5, 6. Index 3, 6.
- Operation $*$: Stack becomes 1, 5, 6, 24. Index 4, 24.
- Operation $/$: Stack becomes 1, 5, 12. Index 3, 12.
- Operation $+$: Stack becomes 1, 5, 12, 13. Index 4, 13.
- Operation $*$: Stack becomes 1, 5, 12, 13, 156. Index 5, 156.
- Operation $+$: Stack becomes 1, 5, 12, 13, 156, 161. Index 6, 161.

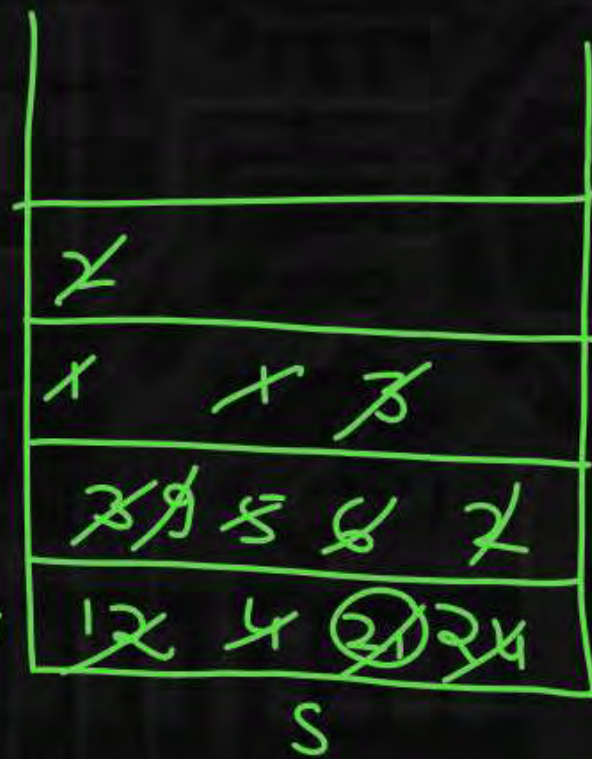


Diagram illustrating the evaluation of the postfix expression $4\ 5\ 1\ +\ * \ 2\ /\ 3\ 1\ 2\ +\ *\ +$ using a stack. The stack grows downwards (increasing index).

- Initial state: Stack contains 2, 24. Index 2, 24.
- Operation $/$: Stack becomes 12. Index 2, 12.

