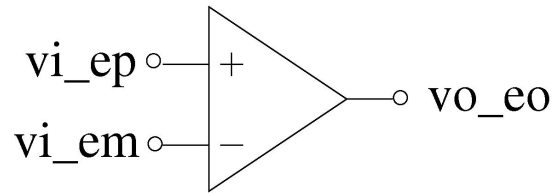
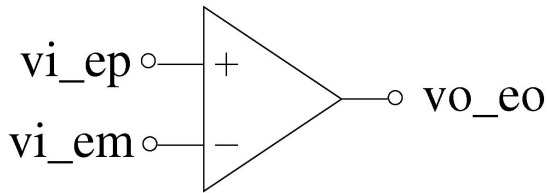


SC_OPAMP2.ece (Prepared by: Rajesh A. Thakker, Govt. Engg. College, Chandkheda, Gandhinagar, Email id: rathakker2008@gmail.com)



(a)

(b)

Opamp

Attributes:

```
mainnodes: vi_ep vi_em vi_op vi_om vo_eo vo_oo gnd
digital_nodes:
rparms: rin=1M rout=10 av=1e5
```

Description:

SC_OPAMP2.ece is an op-amp element used in the bi-phase switched capacitor (SC) circuits. The time-domain description of the op-amp is shown in Fig. a., it is a two-port block (ignore R_{dl} connected between vi_{op} , vi_{om} , and vo_{oo}). The z-domain (small-signal) equivalent is shown in Fig. b, which is a four-port.

As the same file contains time-domain and frequency-domain descriptions, the number of ports in both is made equal. It is the reason that the op-amp element is realized as a four-port element in time-domain, and unused ports/nodes are connected with low-value resistance (R_{dl}).

vi_{ep} , vi_{em} , vi_{op} , and vi_{om} are input nodes. vo_{eo} and vo_{oo} are output nodes. rin is op-amp input resistance and $rout$ is buffer output resistance. av is voltage gain. R_{dl} is internally set to $1\ \Omega$.