6.4 Rat race coupler

Module:6 Microwave Passive circuits

Course: BECE305L – Antenna and Microwave Engineering

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CHENNAI

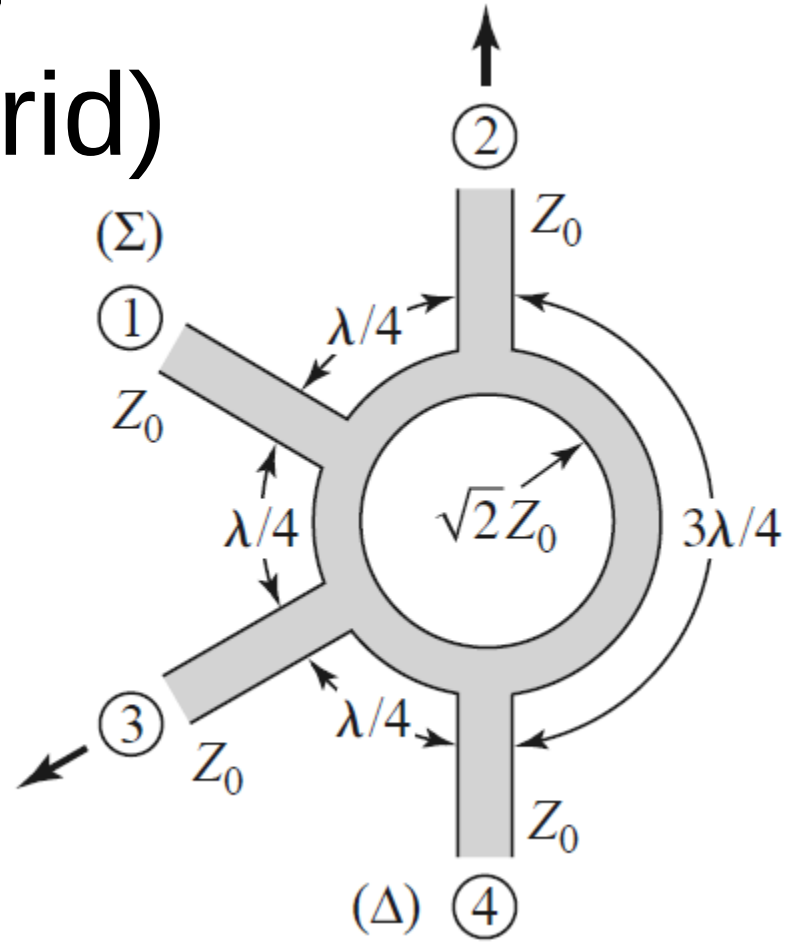
Module:6 Microwave Passive circuits 7 hours

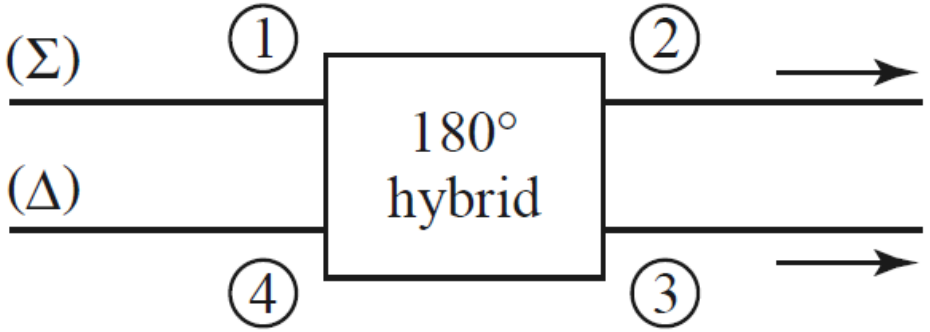
- T junction and resistive power divider, Wilkinson power divider, branch line coupler (equal & unequal), Rat Race Coupler, Filter design: Low pass filter (Butterworth and Chebyshev) - Richards transformation and stepped impedance methods.

- Source of the contents: Pozar

1. Rat Race coupler (Ring hybrid)

- **a signal applied to port 1** will be **evenly split into two in-phase components** at **ports 2 and 3**, and **port 4 will be isolated.**
- If the **input is applied to port 4**, **it will be equally split into two components with a 180◦ phase difference at ports 2 and 3**, and **port 1 will be isolated**.





1. Rat Race coupler (Ring hybrid)

- When operated as a combiner, **with input signals applied at ports 2 and 3**, the **sum of the inputs will be formed at port 1**, while the **difference will be formed at port 4**. Hence, **ports 1 and 4** are referred to as the **sum** and **difference ports**, respectively.
- ideal 3 dB 180◦ hybrid

$$[S] = \frac{-j}{\sqrt{2}} \begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & -1 \\ 1 & 0 & 0 & 1 \\ 0 & -1 & 1 & 0 \end{bmatrix}.$$