

## 5-Maruza. Kuchning energiya o'zgarish orqali ifodasi

Kuyidagi elektromexanik sistemada hosil bo'ladigan kuch (moment) ning tenglamasini topishni ko'rib o'tamiz.

Bitta qo'zg'atish cho'lg'ami bo'lgan sistemani ko'rib chiqamiz. CHulg'aning qarshiligini hisobiga olmagan holda, elektr tenglikning shartini quyidagi ko'rinishda yozish mumkin:

$$U \approx e = L \frac{di}{dt} = \frac{d\psi}{dt}. \quad (1.16)$$

Ma'lumki energetik balansni esa quyidagi tenglama ifodalaydi:

$$dW_{\text{эл}} = dW_{\text{маг}} + dW_{\text{мех}}, \quad \text{bu erda } dW_{\text{мех}} = f dx.$$

Quvvatni topsak

$$f \frac{dx}{dt} + \frac{dW_{\text{маг}}}{dt} = \frac{dW_{\text{эл}}}{dt} = Ui = ei = i \frac{d\psi}{dt}. \quad (1.17)$$

$W_{\text{маг}} = \frac{1}{2} \psi i$  ekanligini hisobga olsak va hosilasini ko'rsak:

$$\frac{dW_{\text{маг}}}{dt} = \frac{1}{2} \left( \psi \frac{di}{dt} + i \frac{d\psi}{dt} \right). \quad (1.18)$$

SHunday qilib, (1.16), (1.17) va (1.18)- tenglamalarga asosan quyidagiga ega bo'lamiz

$$f \frac{dx}{dt} + \frac{1}{2} I \frac{d\psi}{dt} = I \frac{d\psi}{dt}. \quad (1.19)$$

(1.19) dan shu narsa ko`rinadiki, agarda konturdagi tok  $I = \text{const}$  bo`lsa, u holda (1.19) tenglama quyidagi ko`rinishni egallaydi:

$$f \frac{dx}{dt} + \frac{1}{2} I \frac{d\psi}{dt} = I \frac{d\psi}{dt}. \quad (1.20)$$

(1.20) tenglamadan

$$f = \frac{1}{2} I \frac{d\psi}{dt} \Big|_{I=\text{const}} = \frac{\partial \psi}{\partial t} \Big|_{I=\text{const}} \quad (1.21)$$

ga ega bo`lamiz.

Agar  $\psi = \text{const}$  bo`lsa, (1.19) tenglama quyidagi ko`rinishga ega bo`ladi:

$$f \frac{dx}{dt} + \frac{1}{2} \psi \frac{di}{dt} = 0,$$

bundan

$$f = -\frac{1}{2} \psi \frac{di}{dx} \Big|_{\psi=\text{const}} = -\frac{\partial W_{\text{mag}}}{\partial x} \Big|_{\psi=\text{const}} \quad (1.22)$$

ga ega bo`lamiz.