PRACTICE 1

1. The well testing determined that the hydroconductivity factor is 3 10^{-9} m^3/Pa·s, the layer thickness 18 m and the elastic capacity factor of the reservoir rock – $2.5 \cdot 10^{-10}$ Pa^{-1}. Determine the piezoconductivity factor.

ε=$3 \cdot 10^{-9}$ m^3/Pa·s
h=18 m
ß*=$2.5 \cdot 10^{-10}$ Pa^{-1}

$$\chi = \frac{k}{\mu \cdot \beta^*}$$

$$\varepsilon = \frac{k \cdot h}{\mu} \qquad \frac{k}{\mu} = \frac{\varepsilon}{h}$$

$$\chi = \frac{\varepsilon}{h \cdot \beta^*} = \frac{3 \cdot 10^{-9}}{18 \cdot 2.5 \cdot 10^{-10}} = 0.667 m^2 / s$$

2.Determine the coefficient of oil extraction which is achieved due to elastic forces in the circular shape deposit with the radius 35 km, while the reduction of average reservoir pressure by 4 MPa. Thickness of production layer 16 m, open porosity 0,15, oil saturation 0,72, compressibility factors of oil, water and rock correspondently $1{,}5 \cdot 10^{-9}$ Pa^{-1}, $4{,}38 \cdot 10^{-10}$ Pa^{-1}, and $2 \cdot 10^{-10}$ Pa^{-1}, radius of oil-drainage boundary 9,2 km.

R_{res}=35 km
ΔP=4 MPa
h=16 m
m=0,15
s_{oil}=0,72
$ß_{oil}$=$1{,}5 \cdot 10^{-9}$ Pa^{-1}
$ß_w$=$4{,}38 \cdot 10^{-10}$ Pa^{-1}
$ß_r$=$2 \cdot 10^{-10}$ Pa^{-1}
R_{oil}=9,2 km

$$\eta = \frac{V_{oil.ext}}{V_{dep}}$$

$$V_{dep} = \pi \cdot R_{oil}^2 \cdot h \cdot m \cdot s_{oil} = 4{,}59 \cdot 10^8 m^3$$

$$V_{oil.ext} = V_1 + V_2 = \pi \cdot R_{res}^2 \cdot h \cdot \beta_1^* \cdot \Delta P + \pi \cdot R_{oil}^2 \cdot h \cdot \beta_2^* \cdot \Delta P = \pi \cdot h \cdot \Delta P \times$$

$$\times \left(R_{res}^2 \cdot \beta_1^* + R_{oil}^2 \cdot \beta_2^* \right) = 7{,}177 \cdot 10^7 m^3$$

$$\beta_1^* = m \cdot \beta_w + \beta_r = 2{,}657 \cdot 10^{-10} Pa^{-1}$$

$$\beta_2^* = \left[\beta_w \cdot (1 - s_{oil}) + \beta_{oil} \cdot s_{oil} \right] \cdot m + \beta_r = 3{,}738 \cdot 10^{-10} Pa^{-1}$$

$$\eta = \frac{V_{oil.ext}}{V_{dep}} = 0{,}156$$