Que: 1

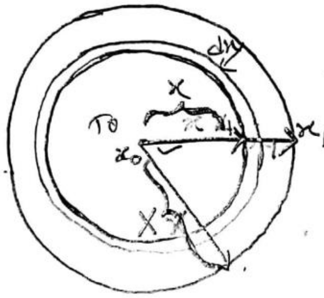
Given that, The boundary conditions are, $T'(x_0) = 0$

$$x_0 = 0$$
$$x_1 = X$$
$$T(x_1) = T_1$$

Now, solving the temperature profile with boundary condition we can write,

$$\frac{d}{dx_0}\left(xk\frac{dT}{dx}\right) = -Qx$$

$$\therefore xk\frac{dT}{dx} = \frac{-Qx^2}{2} + C_1 \quad \text{[differentiating them with r.t. } \cancel{x}\text{]}$$



Or, $0 = \frac{-Q\cdot 0^2}{2} + C_1$

Now, $\frac{dT}{dx} = -\frac{Qx}{2k}$

Or, $T(x) = -\frac{Qx^2}{4k} + C_2 \quad \text{—} (i)$.

Or, $C_2 = \frac{QX^2}{4k} + T_1$

putting the value of C_2 in eqn (i) we can get,

$$T(x) = \frac{-Qx^2}{4k} + \frac{QX^2}{4k} + T_1$$

Or, $T(x) = \frac{Q(X^2 - x^2)}{4k} + T_1$

Or, $T(x) - T_1 = \frac{Q(X^2 - x^2)}{4k}$

Or, $T_0 - T_1 = \frac{Q(X^2 - x^2)}{4k}$

Or, $T_0 - T_1 = \frac{QX^2}{4k} \quad [\because x = x_0 = 0]$

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Assumptions:

The assumptions that are made to get to this equations are:

(i) Steady state
(ii) Axisymmetric
(iii) Constant in z
(iv) Constant thermal conductivity.

Q82

Given that, Cooring.k = 0·015 W/cm-K

cladding, k = 0·15 W/cm-K.

Gap k = 0·004 W/cm-K.

fuel k = 0·05 W/cm-K.

T_s = 600K.

Q = 250 W/cm^3

R_F = 0·6 cm

t_g = 0·005 cm

t_{clad} = 0·05 cm

t_{coat} = 0·01 cm

T_{co} = 600K.

∴ Centerline temperature without coating,

$$T_0 = \frac{QR^2}{4K} + T_s.$$

$$= \frac{250\ W/cm^3 \times (0{\cdot}6cm)^2}{4 \times 0{\cdot}05\ W/cm\text{-}K} + 600K$$

$$= 1050\ K.$$

Centerline temperature with coating,

$$T_{cl} = \frac{LHR\ t_{clad}}{2\pi R_F\ k_{clad}} + T_{co}.$$

$$= \frac{LHR}{2\pi} k_{gap} \frac{t_{clad}}{k_{clad}} + T_{co}. \quad \left[\because \frac{LHR}{2\pi R_F} = k_{gap}\right]$$

$$= 0{\cdot}004\ W/cm\text{-}K \times (0{\cdot}05cm / 0{\cdot}15\ W/cm\text{-}K) + 600K$$

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$= 600.001 K.$

Now, ~~for~~ fuel centerline temperature with

coating $= T_{C1} + T_{C0}$

$= 600.001 K + 600 K$

$= 1200.001 K$

Ans:

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Q.6

Fertile: In fertile isotops can convert into fissile isotops.

Fissile: In that isotops the atoms can undergo fission reactions.

Fissionable: In that nuclide is capable of undergoing fission after capturing high energy nutrons or low energy nutrons.

Q.7

Reasons:

(i) During thermal cycling, pure uranium dramatically swells.

(ii) γU has both anisotropic thermal expansion and anisotropic irradiation growth.

Q.8

Smear density:

The percentage of actual fuel weight contained in the volume enclosed by a unit

P.4

Length of cladding relative to the weight which could be contained if the same volume were occupied by 100% dense fuel.

__Necessary because:__

Because of →

⇒ It provides information on the number and shape of the cells.

__Q: 9__

⇒ Enrich U because it needs to have a higher concentration rather than the U exists in nature.

⇒ UF_6

⇒ Centrifugal works by →

~~rotor~~ rotating at rapid speed

↓

seperating substances using center force

↓

then work as final work

Q.10

Method → Euler method

→ Finite difference method

→ Taylor series method.

Q.11

~~Be~~ Departure from nucleate boiling and critical heating flux because of increase the heat transfer due to mixing and turbulation near to the heated surface.

Q.12

Layer → Light bridge → ~~Fra~~ fuel kernel

→ Kaimos → Buffer.

→ Nasa/LANL. → IPyC

→ SiC

~~Ex: UO2~~ → OPyC.

Ex: UC.