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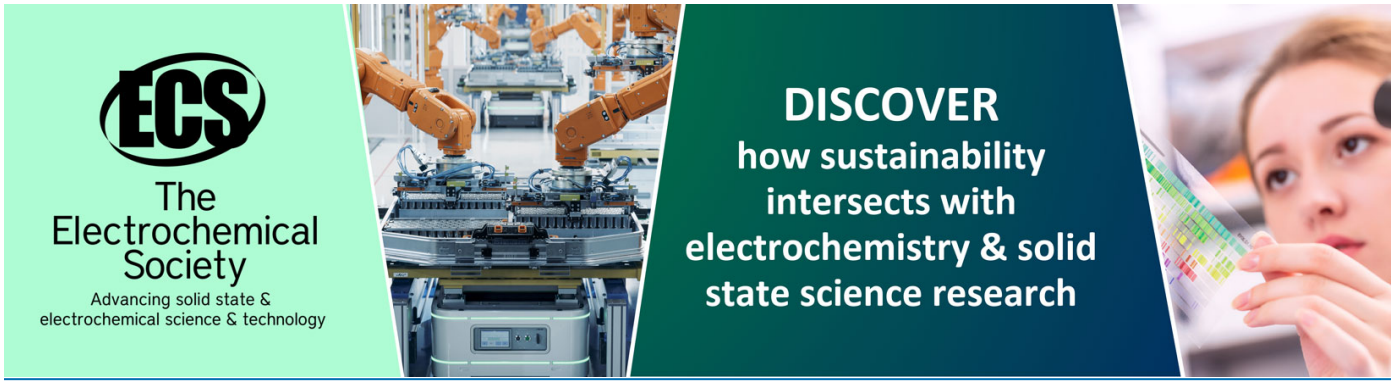

A topological structure on mechanical

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Abstract: In this paper, The concept of topological structure on Mechanical is introduced and some properties are studied.
Key Words: Fuzzy Set, Topological Structure, Mechanical andFuzzy Topology.

INTRODUCTION

In sociology, economics, environment engineering, etc., the classical method does not give the exact value to solve some kind of problems given, where these kind of problems have their own uncertainities. Hence the need of fuzzy arises, fuzzy sets are used to calculate the uncertainities in a problem. In 1965,the researcher, L.A Zadeh was firstly proposed by fuzzy set theory to solve this situations. These fuzzy set theory has been studied for both mathematician and computer scientists and many applications on several areas of research such as machine learning energy producing like in mechanical area, aeronautical area, etc., we are discussed above the topological space, fuzzy topological space and thermal energy. We have solve some problems to fuzzy modes of transfer.

1. PRELIMINARIES

1.1Definition

Let $X \neq \emptyset$, a topological on X, is a collection of "Open Subsets" of X, which satisfy the following

1. $X, \emptyset$ are open,
2. the union of any family of open set is open,
3. the finite intersection of any collection of open set is open.

$\tau =$ {all open subset of X}, Topological space pair defined by (X, τ)

1.2 Example $X = \{a, b, c\}$ and $\{\emptyset, \{a\}, \{a, b\}, X\}$

1. $\emptyset, X$both are open ,
2. Union of any two open set is open,
3. $\{a\} \cap \{a, b\} = \{a\} \epsilon \tau$

1.3 Example
Let $X = \{a, b, c\}$be a set and let $A = \{(a, o.2), (b, 0.5), (c, 1)\}$,$B = \{(a, 0.5), (b, 0.2), (c, 1)\}$ be a two open subset.

1. X, A, B are open,
2. $A \cup B = \{(a, o.2), (b, 0.5), (c, 1)\} \cup \{(a, 0.5), (b, 0.2), (c, 1)\}$
   $A \cup B = \{(a, o.5), (b, 0.5), (c, 1)\}$
   ∴The union of two open subset is open.
3. $A \cap B = \{(a, o.2), (b, 0.5), (c, 1)\} \cap \{(a, 0.5), (b, 0.2), (c, 1)\}$
   $A \cap B = \{(a, o.2), (b, 0.2), (c, 1)\}$
   ∴ The intersection of two open set is open.

1.3 Definition
Let $(X_1, \tau_1) and\ (X_2, \tau_2)$ be a topological space when $X = X_1, X_2, \cdots X_n$
Such that $p_i: (X_1, X_2, \cdots X_n) \to X_i$ which is continuous function, hence the inverse image of P_i is also continuous.

2. FUZZY TOPOLOGICAL SPACES

2.1 Definition:
A family$\delta \subseteq I^x$ of fuzzy set is known as the Fuzzy topology of X,if it satisfies the following axioms

1. $\forall \alpha \epsilon I, \alpha \epsilon \delta \forall A,$
2. $B \epsilon \delta \Rightarrow A \wedge B \epsilon \delta.$
3. $\forall (A_j)_{j \epsilon j} \epsilon \delta \Rightarrow v_{j \epsilon j} A_j \epsilon \delta.$

Remark: The pair (X, δ) is known as a fuzzy topological space, or a functions, the elementsδ are known as a fuzzy open sets.

2.2 Definition
Let $(x, \delta) and (Y, \sigma)$ be a fuzzy topological spaces. The fuzzy space of a product of X and Y are a Cartesian product $X \times Y$ of sets X and Y together within the fuzzy topology is generated as by a family $\{({P_1}^{-1}(A_j), {P_2}^{-1}(B_k): A_j \epsilon \delta, B_k \epsilon \sigma$, where $P_1 and P_2$ are projections of $X \times Y$ onto X and Y respectively}, because ${P_1}^{-1}(A_j) = A_j \times 1, {P_2}^{-1}(B_k) = 1 \times B_k$ and $(A_j \times 1) \wedge (1 \times B_k) = A_j \times B_k$; the family $\{A_j \times A_j \epsilon \delta, B_k \epsilon \sigma\}$ forms a base for the fuzzy product topology$X \times Y$.

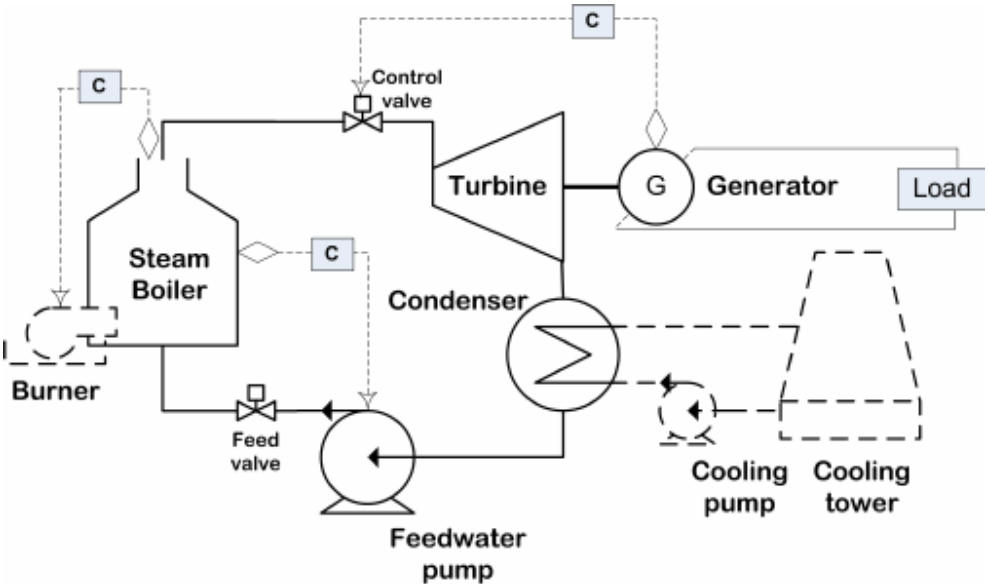
3.THERMAL ENERGY

3.1Definition
Thermal energy used the inner energy of any object by reasoning of the kinetic energy of its Molecules and/or Atoms. The Molecules /Atoms of a temperatured object had large number of kinetic energy, then those of a low temperature are in the form of Translational motion, Rotational, or the cases like gas, Vibrational.

Example of both Thermal and Kinetic energy

1. When due to a rise in temperature ofa molecules and atoms are vibrating higher comes from a substance is also known as thermal energy
2. Heat energy is also named asa Thermal energy.
3. Kinetic energy is an energy of a Moving object.

***Flow chart of Power Plant on Thermal*:**



'Figure 1'

3.1 Modes of Heat Transfer

1. Conduction
2. Convention
3. Radiation

3.1.1Conduction

Conduction is an energy transfer from the greater energetic particle to lower energetic particle due to the interaction between the particle.

Fourier's law of heatconduction

$$Q = -kA\left(\frac{dt}{dx}\right)$$

K –Conductivity of thermal

A - Area

$\frac{dt}{dx}$ - Temperature gradient depends up on distance

3.1.2 Convention

Convention is anenergy transfer between a surface of solid and the motions are in liquid or gas, it is the conduction fluid motion of combined effects.

Newton's law of cooling

$$Q = hA_s(T_s - T_\infty)$$

Q - Heat transfer co-efficient ofConvective
T_s – Surface of the temperature.
T_∞- Temperature outer from the surface
A - Area of surface

3.1.3 Radiation

1. All matter can emit, absorb, transmit the radiation above the Absolute zero.
2. Radiation is the fastest phenomenon of heat transfer.

Stefen - Boltzman law

$$Q_{emit,max} = \sigma A_s T_s^4$$

σ - 5.67x10$^{4W}/_{m}$
A_s– Area
T - Temperature of the surface.

4.Fuzzy topological in thermal energy

4.1 Definition ofFuzzy thermal energy

Thermal energy of Fuzzy Topology(TFT) is the inner energy of a fuzzy object by reasoning of its kinetic energy of an atoms/molecules. The molecules/atoms of a Fuzzy area (σ)heatest one having a greatest energy in the form of a vibration, rotational, in the case of gas, transitional motion,etc.,

4.1 Conduction

The Conduction of Fuzzy Topology (CFT) is a energy transfer from the Higher energy FT particle(HFT) to Lower energy FT particle(LFT) due to the interaction between the fuzzy particle.

Fuzzy Fourier's law of heat conduction

$$\boldsymbol{\delta = -K\sigma\left(\frac{\theta_0 - \theta_1}{\alpha}\right)}$$

4.1.1Problem

In a outer fuzzy topological surface of a 0.2m thick concrete wall is kept at a initial fuzzy temperature of 0.51^{o}C, while the inner fuzzy surface is kept 0.7^{o}C, in the thermal fuzzy conductivity of concrete 0.92W/(mk).

Determine the FT Heat loss through a wall 0.6m long and 0.7m high.

Solution:

K - 0.92 w/(mk)
θ_1- 0.7^{o}C
θ_0- 0.51^{o}C
δ -?

In fuzzy expression on Fourier's law of conductivity,

$$\delta = -K\sigma\left(\frac{\theta_0 - \theta_1}{\alpha}\right)$$

$$=(-0.92)(0.6 \times 0.7)\left(\frac{0.51-0.7}{0.2}\right)$$

$$\delta = 0.36$$

The Fuzzy fourier's law of heat conduction is 0.36.

4.2Convention

The convention of fuzzy topology is an energy transfer between a Surfaceof a Solid in Fuzzy Topology(SFT)to the Liquid surface Fuzzy Topology(LFT) or Gas Fuzzy Topology(GFT) that is in amotion in a topological, it is the conduction fluid motion of combined effects.

$$\boldsymbol{\delta = \theta_o + \sigma e^{-ht}}$$

Problem 4.2.1

An object is heated to 0.7°F and to cool in a room, whose air temperature away on the surface is 0.2°F, after 0.10 min the temperature on fuzzy area is 0.3°F. what is the temperature after 0.2 min.

Solution:

$\theta_0 = 0.2°\text{F}$ $\theta_1 = 0.3°\text{F}$

$\theta_1 = 0.7°\text{F}$

$$\delta = \theta_o + \sigma e^{-ht} \cdots (1)$$

t=o, $\theta_1 = 0.7$

Step 1:

In initial time, $t = 0$, $\theta_1 = 0.7$ in eqn(1)

$$0.7 = 0.2 + \sigma e^{-h(0)}$$

$$0.5 = \sigma e^{0}$$

$$\sigma = 0.5$$

Step 2:

$t = 0.1$, $\theta_1 = 0.3$, $\theta_0 = 0.2$, $\sigma = 0.5$ sub in (1)

$$0.3 = 0.2 + (0.5)e^{-h(0.1)}$$

$$0.1 = 0.5e^{-0.1h}$$

$$\frac{0.1}{0.5} = e^{-0.1h}$$

$$-0.1h = \log\left(\frac{0.1}{0.5}\right)$$

$$h = -\frac{1}{0.1}log\left(\frac{0.1}{0.5}\right)$$

sub $h = -\delta = \theta_o + \sigma e^{-ht}$, $\sigma = 0.5$ in (1)

$$\delta = 0.2 + (0.5)e^{-(\frac{1}{0.1}log\left(\frac{0.1}{0.5}\right))(0.2)}$$

$$= 0.2 + 0.5(e^{log\left(\frac{0.1}{0.5}\right)^2})$$

$$= 0.2 + 0.5\left(\frac{0.1}{0.5}\right)^2$$

$$=0.2+0.5(0.04)$$

$$\delta = 0.22$$

Radiation 4.3
In a fuzzy topological space, there is no medium between all matters can emit absorb,transmit the radiation above the absolute zero.

$$\boldsymbol{\delta_{(emit,max)} = \sigma\theta_s T_s^4}$$

Problem 4.3.1
When the power would it produce if operated at a temperature of only 500 Kelvin.
Solution:

$$T_s = \frac{T_{hot}}{T_{cold}}$$
$$\theta_s = \frac{\theta_{hot}}{\theta_{cold}}$$
$$\delta \Rightarrow \frac{\theta_{hot}}{\theta_{cold}} = \left(\frac{T_{hot}}{T_{cold}}\right)^4$$
$$\frac{200}{\theta_c} = \left(\frac{200}{500}\right)^4$$
$$\frac{200}{\theta_c} = (4)^4$$
$$\frac{200}{\theta_c} = 256$$
$$\frac{200}{256} = \theta_c$$
$$\theta_c = 0.78\ watts$$

Conclusion: In this paper we discussed topological space, fuzzy topological space and thermal energy, we execute this thermal energy explained in fuzzy topology and we solved some problems to fuzzy modes of transfer.

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