Using "AL-HARAKA AL-GOHEAREA THEORY" in Explanation the Vibration Analysis results of Simply Supported beam with micro Crack

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Abstract:-

In this research it had been using the Finite Element Method (FEM) with computer application(ANSYS) to analysis the vibration of simply supported beam(s.s.b), the first five natural frequency with and without micro crack is calculated and compared the results, which showed the influence on the stiffens ,using(AL-Haraka AL-Gohearea theory) to explained this effects.

Another comparison took place to study the effect of outside load on the natural frequency and mod shape of (s.s.b) with and without micro crack.

الخلاصة:-

في هذا البحث تم استخدام طريقة فروقات العناصر (FEM) استخدام تطبيق (ANSYS) في الحاسوب لتحليل الاهتزاز لعتبة مسندة إسنادا بسيطاً و حساب قيم الترددات الخمس الأولى و مقارنة النتائج مع عتبة تحوي في تركيبها الداخلي على شق مجهري ،وقد لوحظ في قيم الترددات لان الشق يؤثر في تغير صفات المادة المكونة للعتبة ومن أهمها الجساءة التي تؤثر في قيم الترددات وتفسير هذا التأثير باستخدام نظرية الحركة الجوهرية ، ولزيادة فهم اثر الشق وتوظيف النظرية تم مقارنة النتائج في حال وجود قوة خارجية على العتبة للترددات الخمس الأولى ، وجد انه وجود قوة خارجية لعتبة بشق مجهري تسجل اختلافاً في قيم الترددات

1- Previous researches :-

This topics had two parts ,the first one dealing with researches study the effect of crack in beam and different structures, the second is about the role of (AL-Haraka AL-Gohearea theory) .

In 1905(Volterra) proposed the continuum constriction of a dislocation, in 1934 (Taylor,Orowan and Polany) postulated the presence of dislocation as a mechanism weaking of a crystal[1]. In 1983 (Zdenk & B.H.)studied the fracture as a pack cracks they modeled stress-strain relation to suit the effect of gradual micro cracking in the crack band are drive with compliance rather stiffness matrices[2].

(J .fernandez and et al) used a simplified method of evaluating the fundamental frequency for the bending vibrations of cracked Euler- Bernouili beam they transverse deflection of the cracked beam is constructed by adding polynomial functions to that of un cracked beam using (FEM) with(ABAQUS) computer analysis[3].In 2007(Julio & et al) showed some procedures for solving – bidimensional linear elastic fracture mechanics problems in two Finite element programs and made an educational proposal for using this soft ware's for a better understanding in fracture mechanics , they used both (ANSYS) and (FRANC2D) software[4]. (Daniel H.Coters and Ever J.) derived a constrictive model to predicated the onset and evolution of matrix cracking and the subsequent stiffness reduction is analytically , the formulation is valid for symmetric laminates with other wise arbitrary stacking sequence and matrix cracks they proposed model calculated the mechanical properties of the damaged laminate as function of crack densities[5].

In 2012(A.S.Bouboul and et al) submitted a vibration analysis for a sample with opened crack using (FEM)and studied the crack location and depth effect on vibrations values of whole structures[6] .

The second parts care with the (AL-Haraka AL-Gohearea theory) for (Al-Sherazi) it notes that the engineering research stay away from using this theory as means to explained the results to understanding the nature of internal motion of structure materials in mechanical parts. Other science took a good benefit of this theory ,(Einstein) substantiate after hundred years 'time concept' as fourth distance agreed with (Al-Sherazi) theory , where (Einstein) presented time is existence of motion and time is two parts , concluded with the body and absolute attributed all universal motion to it, and velocity between (0 - ∞) which found absolution for many intractable problems to understand time that gave in (Relativity theory) at 1905 and (Special theory) at 1915[7],[8].

Same concept of (AL-Haraka AL-Gohearea theory) of explaned time is not eternal also depending on this theory able to explained and predicted the physical phenomena which (Newten) unable to explained it,(Enstein),agree once more with (Al- Sherazi) , that material substance had engineering measurements and spatial

dimension (Geometric). It also had other dimensions called time which (give the fourth dimension)[9],[10].

From contemporary theories depend on (AL-Haraka AL-Gohearea theory) the (Great Comic Explosion Theory) for (George Gamoff) in 1948 later researches confirmed it in 1960 and 1970 which according to (AL-Haraka AL-Gohearea theory) there is an internal (body) motion in material caused the outside results (changes)[11],[12].

2-(AL-Haraka AL-Gohearea theory) ;-

It according to the philosopher (Al- Sherazi) in his philosophical creativity during eleventh century with(AL-Haraka AL-Gohearea theory),he gave unpractical possibility in scientific research in the depth of the philosophical aiming of contributing the solution of the origin of the problems[10] .

The main basic of the theory is:"The material world still in continuous renewal-material in it's essence- in the second time not the same material in the first time , material is in the continuous substantial (Joharea)motion"[11].

Motion don't touch the natural phenomena and it's occasional surface only, but ,it's has evolved in the core of nature[12].[13].(Al- Sherazi) with his theory excellence up "Socrates"(AL-Haraka AL-Gohearea theory) it's not in symptoms only (Quantum, How , where , when) but in the inner dynamic of the universe which lead to aim move it from power to act, and the motive had two types:-

1-Nature motion: the motion in body according to its nature.

2-Forced motion: the motive of motion is outside the body, and the motion is reverse its nature.

So, the inference of origin of the article motion mortgaged on two factors :-

1-movement and change : the main cause of all the occasional movements and superficial movements in all natural and mechanical bodies is especial, the force in bodies ,so, body still in motion as force still act and nothing from outside impedes it's career, the real reason for motion is (Strength list of body) and what came outside results of it is a thrills for it.

2-Fit the cause and the result: the proportionality is in the Stability and regeneration, so, if the cause of the movement stand and stable the results are stand and stable, that is contrary the meaning of the movement and evolution[11],[13].

3-Crystal defects:-

Fracture material is serious problem , it has connection to mechanical properties , if a material is given the excessive load it will results a changing in the properties of the materials ,which is, (AL-Haraka AL-Gohearea theory) presented its basic consipts[14],[15],[16] .

The design control is a fait against fracture is due to cracks, when cracks reach a certain critical length ,it can propagate castrophically through the structure which is a crystallographic defect or (Dislocation) [17],[18] .

Dislocations play diverse roles in determining materials structures ,which is the internal bower in the (AL-Haraka AL-Gohearea theory), the most important role is to weaken the crystal strength and influences the properties of material as stiffens "this defect and its effect is a gradually in the (AL-Haraka AL-Gohearea theory) "[19],[20],[21],[22] ,later this defect influences on the :

1. The natural frequency.
2. The amplitude response due to vibration.
3. Mode shape.

That,it is important to detect crack and its effects on the structure[23],[24].

4.Case study:

4-1 simply supported beam (s.s.b.)

In this study the effect of micro crack in the middle of (s.s.b) on natural frequency are calculated and compared the results with other (s.s.b) without crack using the FEM analysis software "ANSYS".Table(4-1)[24] shows the properties of (s.s.b) with and without crack another compared toke place to notes the effect of load at middle beam on the first five natural frequency

properties of (s.s.b) without crack		Properties of (s.s.b) with crack	
Width	15mm	Width	15mm
Depth	25 mm	Depth	25 mm
Length	0.5m	Length	0.5m
Elastic modulus of the beam	207 Gpa	Elastic modulus of the beam	207 Gpa

Passon's ratio	0.3	Passon's ratio	0.3
Density	780 kg/m^3	Density	780 kg/m^3
Type of vibration	Free analysis	Type of vibration	Free analysis
		Location of crack	Medal of (s.s.b)
		Length of crack	0.1 mm
		Width of crack	0.5 mm

table (4-1)

properties of (s.s.b) without and with crack[24]

4-2 FEM ANALYSIS :

The model built had been built with(ANSYS in 3D using SOLID 186 tetrahedral 20 node break element) ,the modal is shown in Fig.(4-1) ,Block Lanczos method which familiar in symmetric structures, Fig(4-2) shown the modal with internal middle crack and as shown we used a refined mesh at crack location for more quart in result .

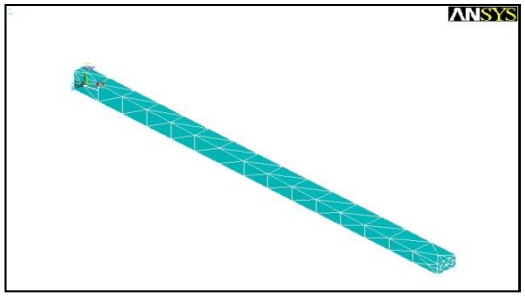


Fig.(4-1)

the modal without crack

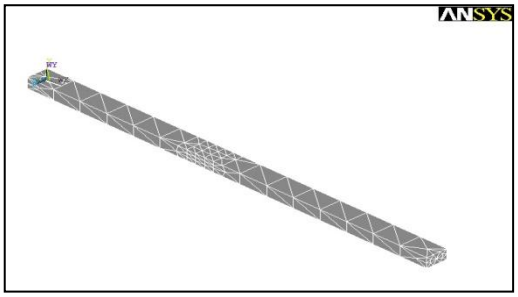


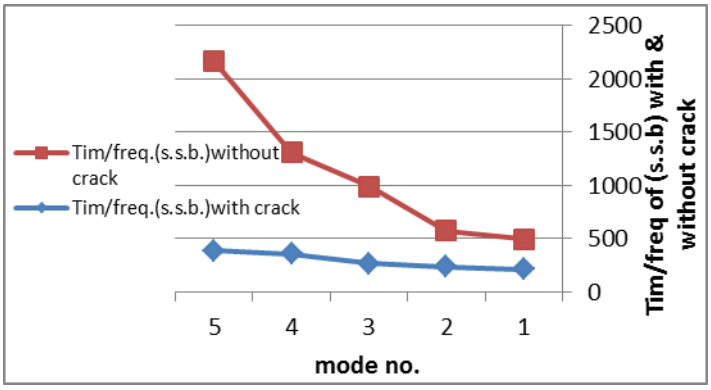
Fig.(4-2)

the modal without crack

5-Results and conclusion :

5-1 Results :

Table (5-1) shows a comparsion between first five Natural frequencies of (s.s.b)with and without microcrack,fig. (5-1)show this , it can essay see that the first five mode for (s.s.b)with crack had lest values comparing with (s.s.b) without crack and that because that crack influence on the stiffness of (s.s.b) which effect on values of natural frequencies.

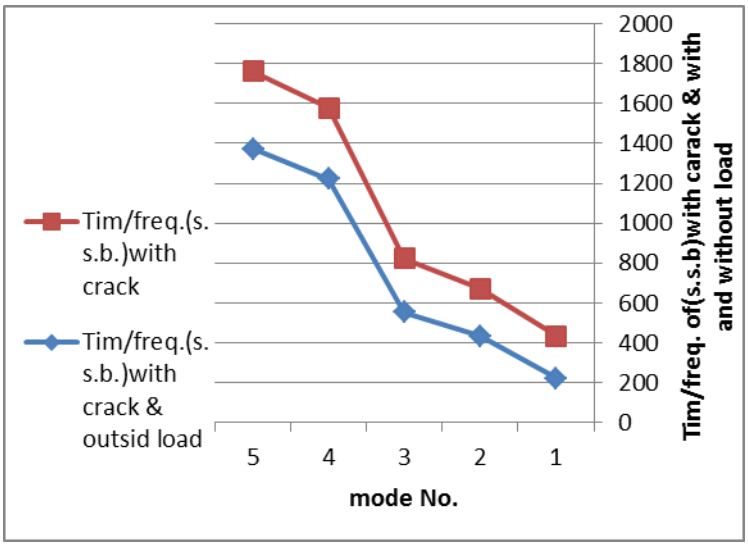


no. of natural freq.	Tim/freq.(s.s.b.)without crack	Tim/freq.(s.s.b.)with crack
1	284.91	212.63
2	333.68	239.34
3	721.89	269.98
4	956.07	356.38
5	1775.3	388.72

Fig.(5-1)first five Natural frequencies with and without microcrack

Tabl(5-1)first five Natural frequencies with and without microcrack

While table (5-2) shows a nother comparsion between first five Natural frequencies of (s.s.b)with and without microcrack with the applied load ,fig. (5-1)show this



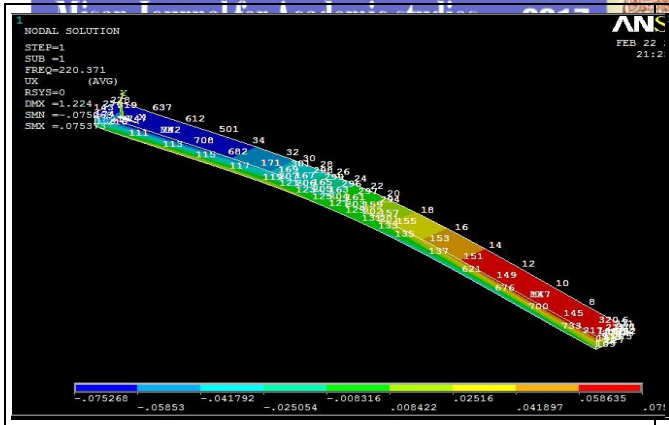
no. of natural freq.	Tim/freq.(s.s.b.)with crack without load	Tim/freq.(s.s.b.)with crack & outsid load
1	212.63	220.37
2	239.34	433.89
3	269.98	553.89
4	356.38	1222.2
5	388.72	1372.3

Tabl(5-2)first five Natural frequencies with and without load

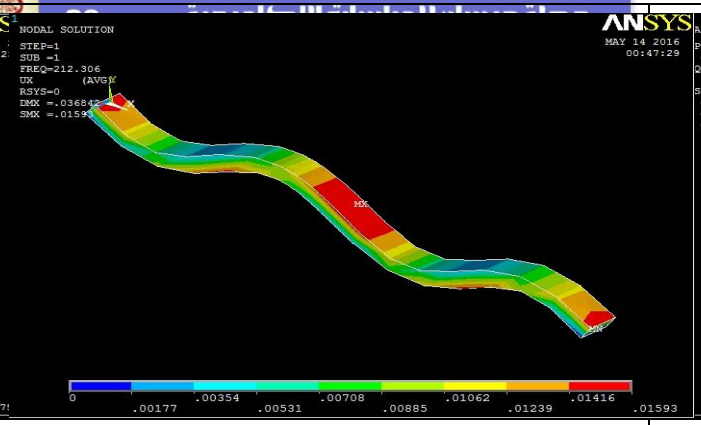
Fig.(5-2)first five Natural frequencies with and without load

The next figers shows the effects of micro crack on (s.s.b) on the first five natural frequencies and mode shap of it which analyzed with (ANSYS).

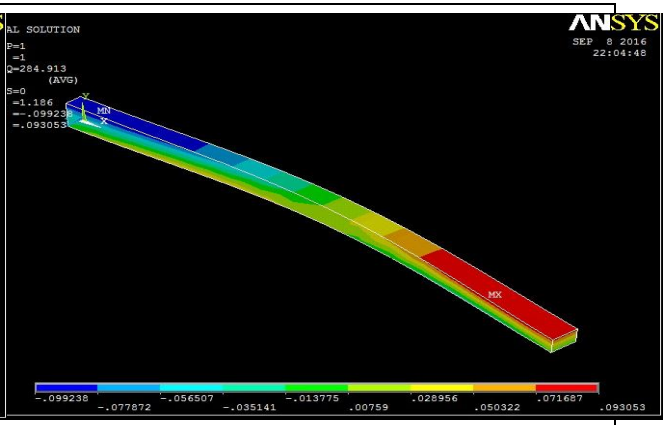
Fig.((5-3-a) ,(5-3-b),(5-3-c),(5-3-d) ,(5-3-e)) shows the first five mode shape of (s.s.b) without crack .Fig((5-4-a),(5-4-b) (5-4-c), (5-4-d),(5-4-e)) the first five mode shape of (s.s.b) with micro crack.Fig.((5-5-a) (5-5-b) ,(5-5-c) (5-5-d) ,(5-5-c) (5-5-e)) shows the effect of load on mode shape of (s.s.b) with crack once and without micro crack on .



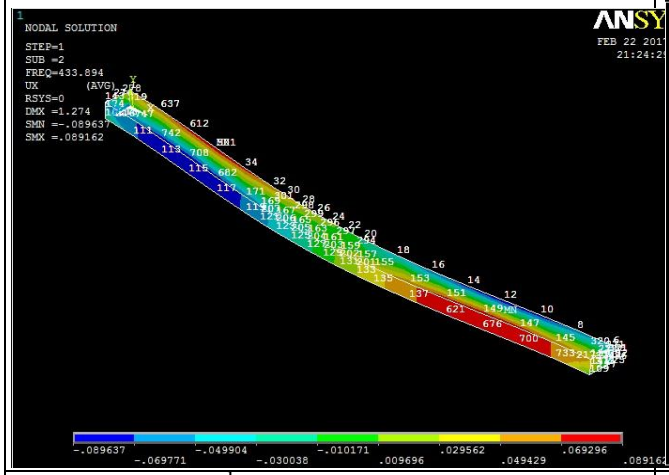
fig(5-5-a) 1st mode shape of(s.s.b)with crack and load



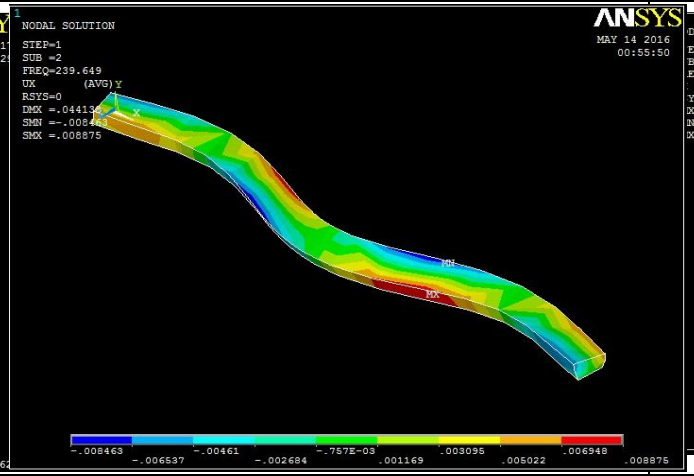
fig(5-4-a) 1st mode shape of(s.s.b)with crack and without load



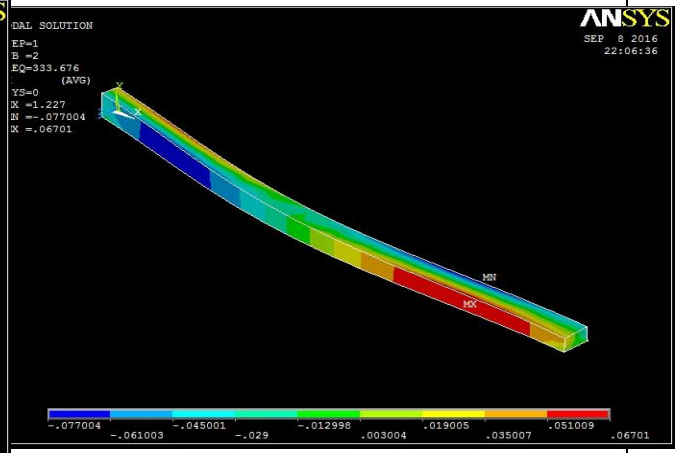
fig(5-3-a) 1st mode shape of(s.s.b)without crack and load



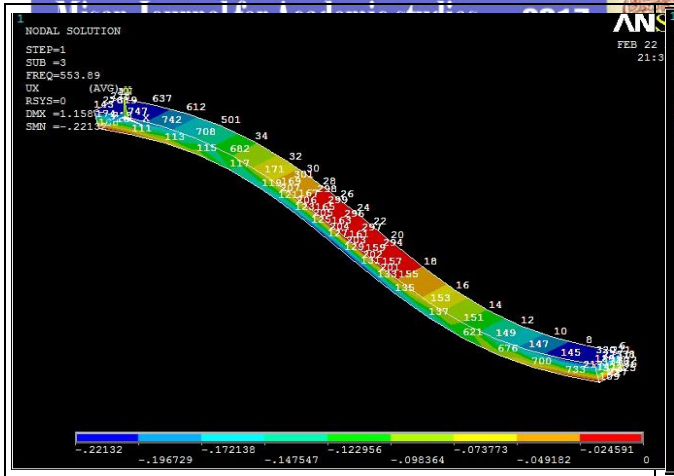
fig(5-5-b) 2nd mode shape of(s.s.b)with crack and load



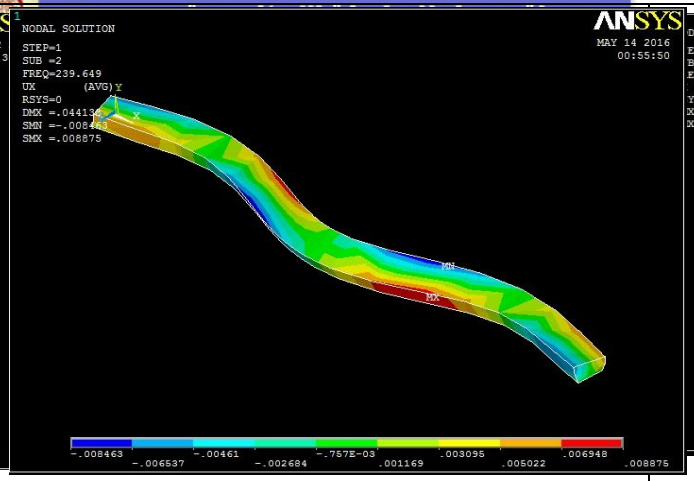
fig(5-4-b) 2nd mode shape of(s.s.b)with crack and without load



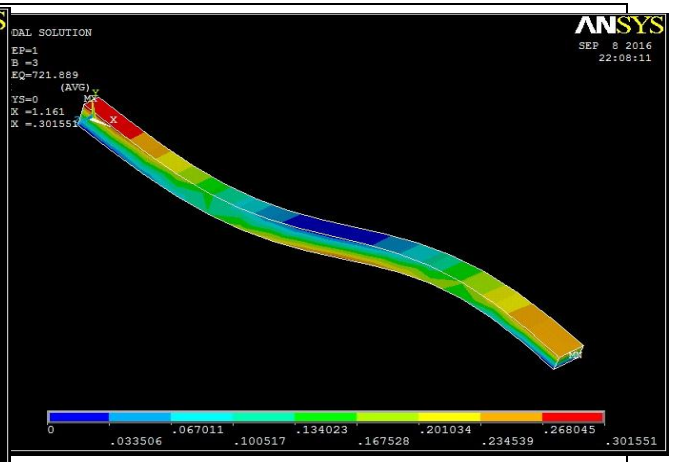
fig(5-3-b) 2nd mode shape of(s.s.b)without crack and load



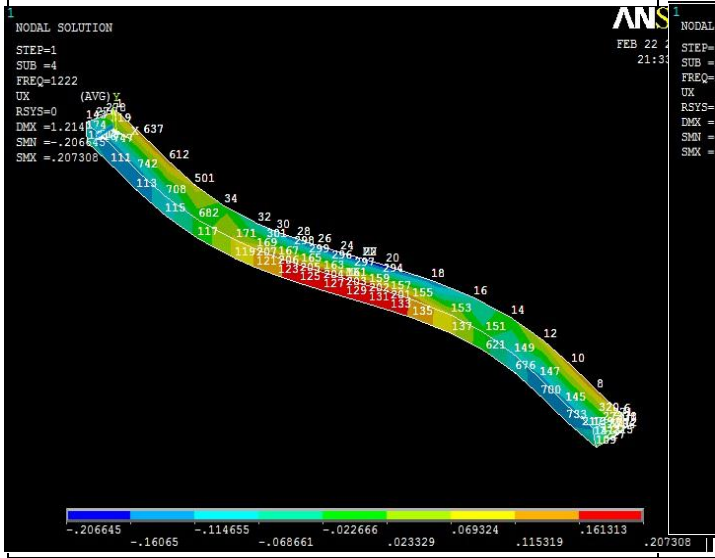
fig(5-5-c) 3rd mode shape of(s.s.b)with crack and load



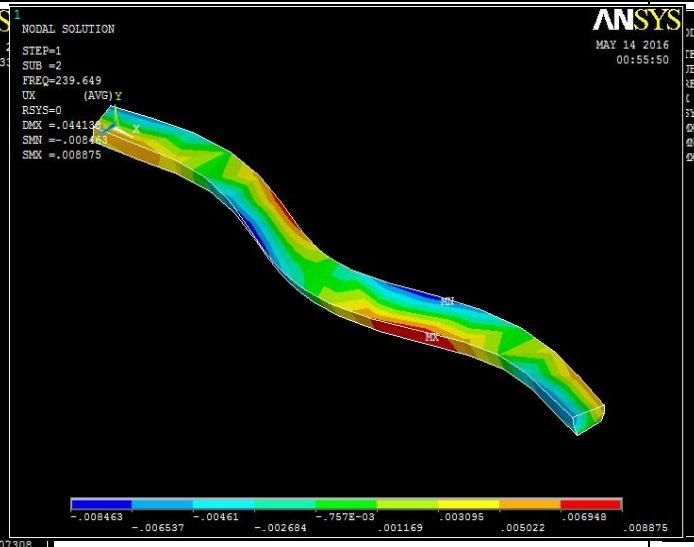
fig(5-4-c) 3rd mode shape of(s.s.b)with crack and without load



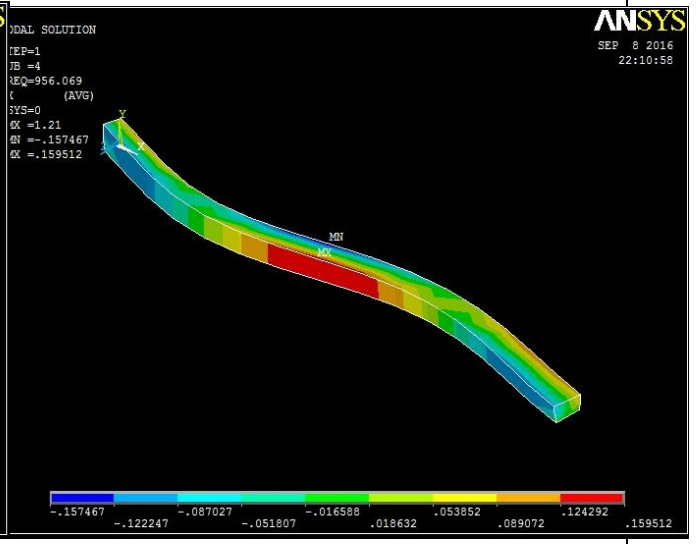
fig(5-3-c) 3rd mode shape of(s.s.b)without crack and load



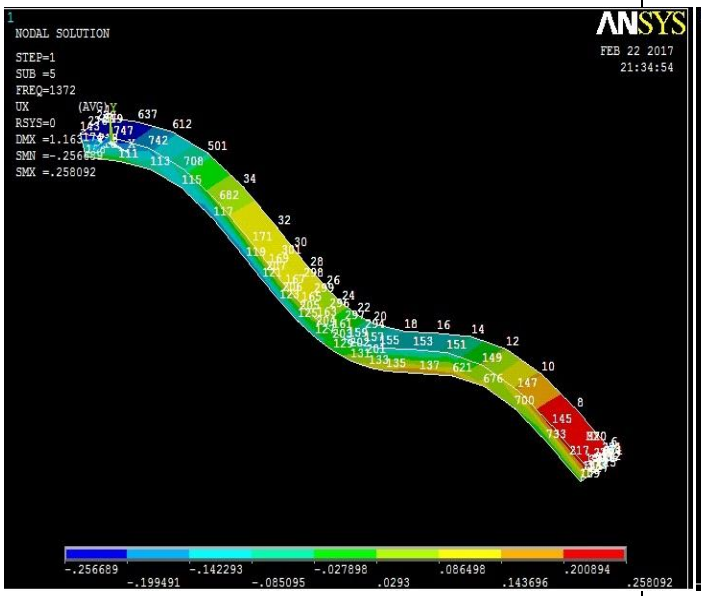
fig(5-5-d) 4th mode shape of(s.s.b)with crack and load



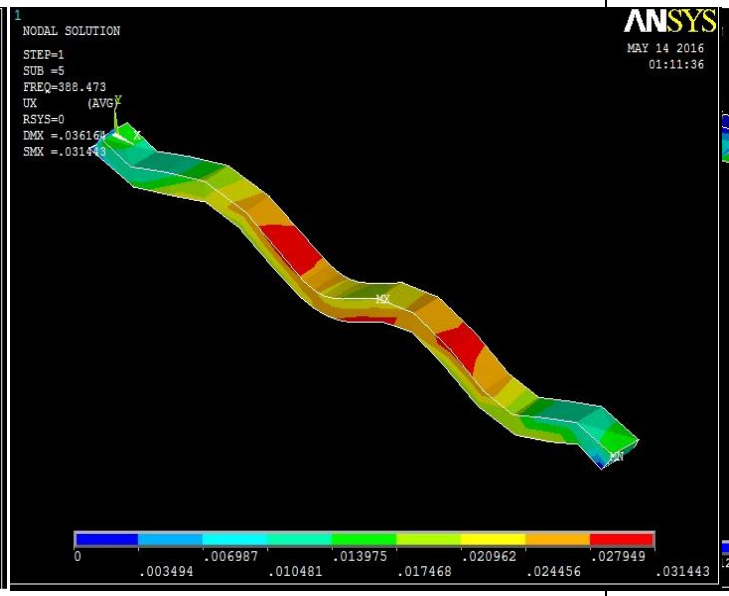
fig(5-4-d) 4th mode shape of(s.s.b)with crack and without load



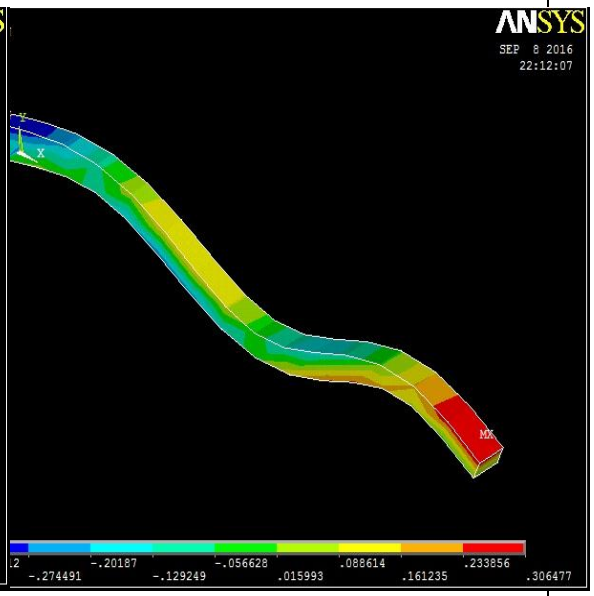
fig(5-3-d) 4th mode shape of(s.s.b)without crack and load



fig(5-5-d) 5th mode shape of(s.s.b)with crack and load



fig(5-4-e) 5th mode shape of(s.s.b)with crack and without load



fig(5-3-e) 5th mode shape of(s.s.b)without crack and load

5-2 conclusion :

1- Table(5-1)shows drop the value of natural frequency of (s.s.b) with crack ,the reason in that according to concept of (AL-Haraka AL-Gohearea theory) and surface motion one factor transverse in all bodies is due to intrinsic movement their results appear as evidence, crack is the appearance of this movement (in the origin of structure) due to dislocation which is a crystallography defect happened without external reason (accident in the origin in the structures) due to (modulation , presence of sediment deposits, . . . ect) the crack has been treated as being over time , which is out of this research , practically crack strongly influence stiffness which is influence the value of natural frequency.
2- Table(5-2)shows drop the value of natural frequency of (s.s.b) without crack and without external load , practically it's understandable from noting the equation of motion the external load is un additional factor to increase the natural frequency and is compatible with the second cause of movement ,where, the presence of external coercive load constitutes an a additional factor natural one increase dislocation movement ,which means un proportional in cause and result, so ,external load arouses a forced movement because the cause is in motion so that result is in motion to.
3- The approach in this interpretation is not a void of results and calculations but ,it complement and promote scientific vision but from another angle, it's possible to take advantage of the philosophical aspect offered by its promotion of scientific and practical results.
4- Gave a chance to monitoring and predicating presents micro crack in addition available means.
5- Using the FEM to analysis with Ansys software is a powerful way to identify and analyze vibration which is a scientific and economic way to determine wither a crevice where the lack of frequency values of nature is there evidence of a crack in the internal structure.

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