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Experimental Strength Behaviour and ANSYS Analysis of Spandex Fibre Reinforced Concrete

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ABSTRACT: The analysis and behaviour of spandex fibre reinforced concrete filled beams is discussed in this paper. A nonlinear finite element model was developed for the analysis of the beams. The stainless steel used in the pin ended axially loaded beams test had an external length to plate thickness (D/T) ratio of 50 . Spandex fibre a kind of synthetic fibre is used in concrete to improve the ductility of concrete. Made with commercially available steel and synthetic fibre has been investigated flexural stress deflection used to determine flexural strength of concrete was found to increase when synthetic fibre . The Ultimate strength testes were carried M25 grade concrete for compressive strength ,split tensile strength ,and flexural strength and test results were compared with conventional concrete with addition of spandex synthetic fibre concrete. The flexural strength measured deflection of the beam in the concrete and in the flexural reinforcing beams and the cracking pattern used monitored during the test at different stages of the loading until failure. The stress- strain, deflection, deformation pattern will be analysed by ANSYS software.

KEYWORDS: Spandex fibre compressive strength ,split tensile ,flexural strength

I. INTRODUCTION

Fibre reinforced concrete (FRC) containing fibrous material increases its structural integrity. It contains short discrete fibres that are uniformly distributed and randomly oriented. Fibres include synthetic fibres and natural fibres. Within these different fibres that character of fibre reinforced concrete changes with varying concretes, fibre materials, geometries, distribution, orientation and densities. Fibres are usually used in concrete to control plastic shrinkage cracking and drying shrinkage cracking. They also lower the permeability of concrete and thus reduce bleeding of water. Some types of fibres produce greater impact, abrasion and shatter resistance in concrete. Generally fibres do not increase the flexural strength of concrete, so it cannot replace moment resisting or structural steel reinforcement. Some fibres reduce the strength of concrete.

1.1 INTRODUCTION TO ANSYS

ANSYS is an engineering simulation software provider founded by software engineer John Swanson it develops general -purpose finite element analysis and computational fluid dynamics software .while ANSYS has developed a range of computer aided engineering products it is perhaps best known for its ANSYS workbench mechanical and ANSYS multi physics products . ANSYS mechanical and ansys multi physics software are non-exportable analysis tools incorporating pre-processing solver and pre-processing moulds in a graphical user inter face . these are general purpose finite element modelling packages for numerically solving mechanical problems including transient dynamic structural analysis ,heat transfer and fluid problems as well as acoustic and electromagnetic problems . ANSYS mechanical technology incorporates both structural and material non linearities .ANSYS multi physics software includes solvers for thermal ,structural cfd electromagnetic and acoustics and can sometimes couple these separate physics together in order to address multi-disciplinary applications .

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II. LITRATURE REVIEW

V.V. GARBARUKA, E.P. DUDKINA, V.A. IVLIEVA (1) Have describes about The use of polymer fiber-reinforced concrete is one of the most promising trends in tram track development. . The analysis of such structures has shown a number of their advantages: reduced construction time, economic benefits in terms of reducing cost and labour, and construction technology simplification. Mathematical modelling of structure strength characteristics and field testing specifying the model parameters are required for the subsequent use of fiber-reinforced concrete as tram track foundation.

SURENDRA P. SHAH (2) Had describes about current applications of fiber reinforced concrete involve the use of fibers ranging around 1 percent by volume of concrete. It is usually assumed that fibers do not influence the tensile strength of the matrix, and only after the matrix has cracked do the fibers contribute by bridging the cracks. Recently, it has been possible to incorporate relatively large volumes (ranging up to 15 percent) of steel, glass, and synthetic fibers in concrete. With such a large volume of fibers in concrete, some evidence presented in this paper indicates that the fibers may substantially increase the tensile strength of matrixes.

BANOTHU S AND VINAYA K (3) Had describes about Natural fiber Composites typically have a fiber or particle phase that is stiffer and stronger matrix acts as a load transfer medium between fibers, and in less ideal cases where the loads are complex, the matrix may even have to bear loads transverse to the fiber axis. In this research the comparative synthesis and analysis of Kenaf fiber (FRPMC1) and Polmerafibers (FRPMC2) are treated with NaOH solution and the fibers are properly reinforced with polypropylene resin and epoxy resin respectively in a matrix form to prepare hybrid composite laminates of 6 mm fiber length thereafter to with suitable specimens with ASTM D-638 and D-790 standards.

III. RESULTS AND DISCUSSION

The results of the engineering properties of Coarse Aggregate such as Specific Gravity, Aggregate Crushing Value, Aggregate Impact Value, Aggregate Water Absorption and Sieve Analysis Test and also presented graphically in below. The specific gravity of the natural coarse aggregate showed while recycled showed This indicates that natural coarse aggregates satisfies the BS 882(1992) requirements greater than for concrete while the discarded coarse aggregate is failed to meet requirement. From the values shown in aggregate crushing value of the fibre reinforced concrete. aggregate higher than that of the natural aggregate .

Table 3.1 Compressive strength test value spandex fibre concrete aggregate

SI NO	Specimen	compressive strength value
1	Conventional concrete	29.97
2	5% addition of fibre	35.47
3	10% addition of fibre	32.13
4	15% addition of fibre	31.53
5	20% addition of fibre	30.58
6	25% addition of fibre	29.02

Table 3.2: Split tensile strength of synthetic fibre spandex concrete specimens

Specimen	Days	Average Tensile Strength (N/mm ²)
Conventional concrete	14	2.27
	28	2.65
5%	14	3.36
	28	3.85
10%	14	2.69

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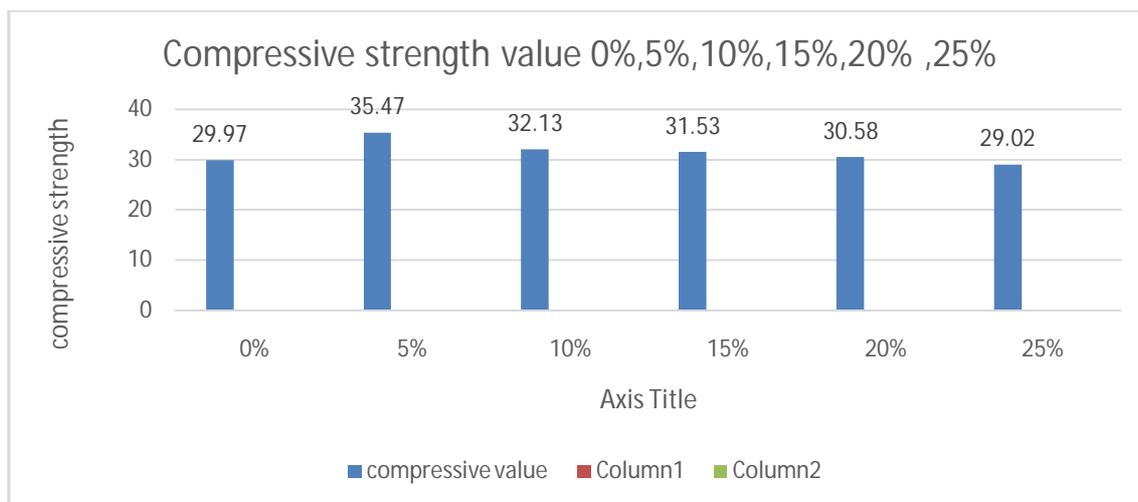
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	28	3.08
15%	14	2.74
	28	3.82
20%	14	3.04
	28	3.18
25%	14	2.87
	28	3.56

Table 3.3 Flexural strength of synthetic fibre spandex concrete specimens

Specimen	Days	Average flexural Strength (N/mm ²)
Conventional concrete	14	5.47
	28	6.34
5%	14	6.16
	28	8.04
10%	14	5.75
	28	6.82
15%	14	5.87
	28	6.43
20%	14	6.18
	28	6.23
25%	14	5.76
	28	6.11

3.4 Flow chart with compressive strength value



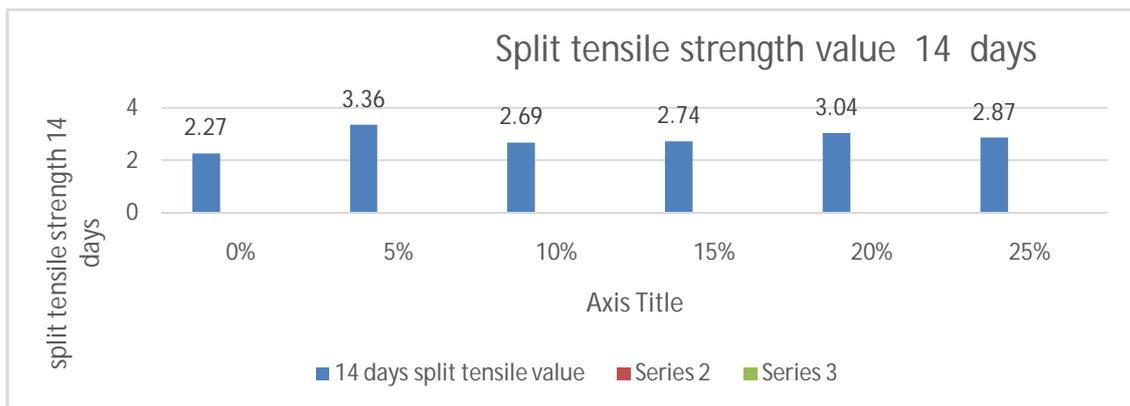
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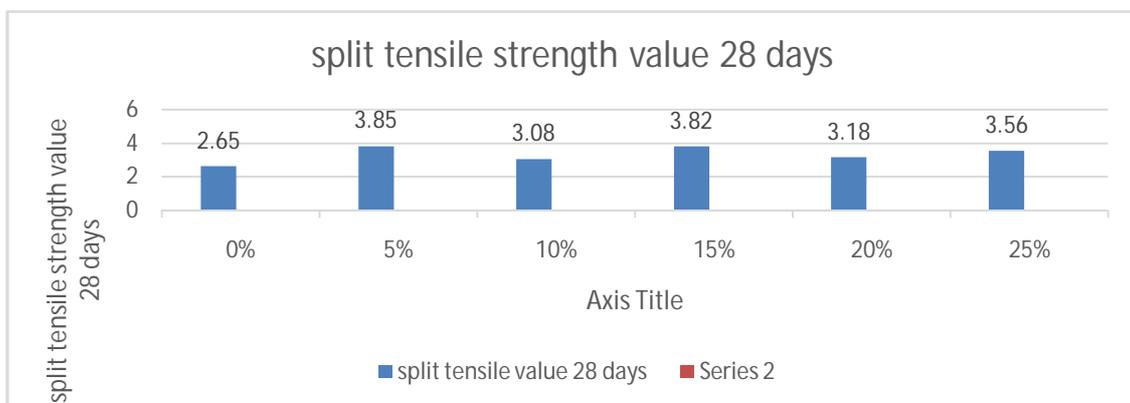
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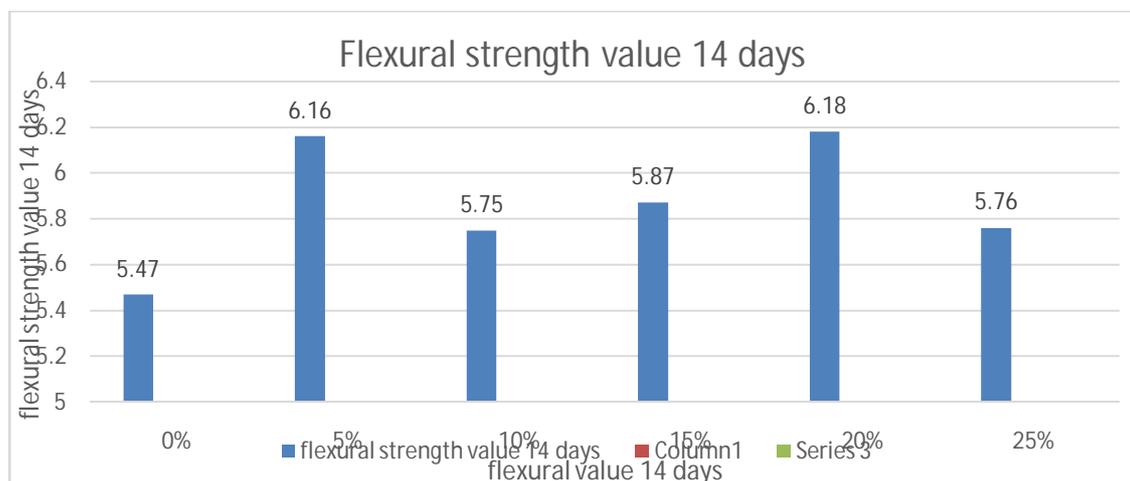
3.5 Flow chart with split tensile strength value 14 days



3.6 Flow chart with split tensile strength value 28 days



3.7 Flow chart with Flexural strength value strength value 14 days



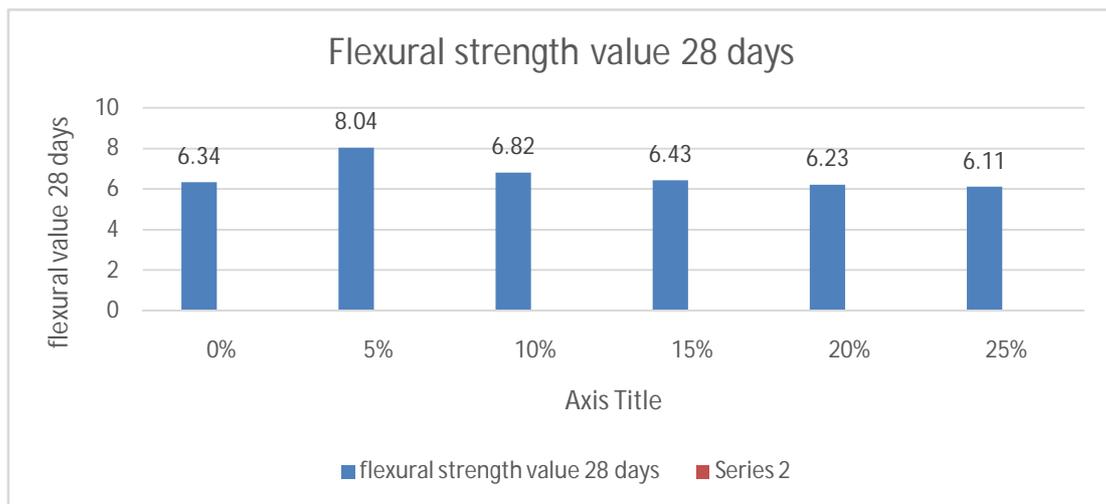
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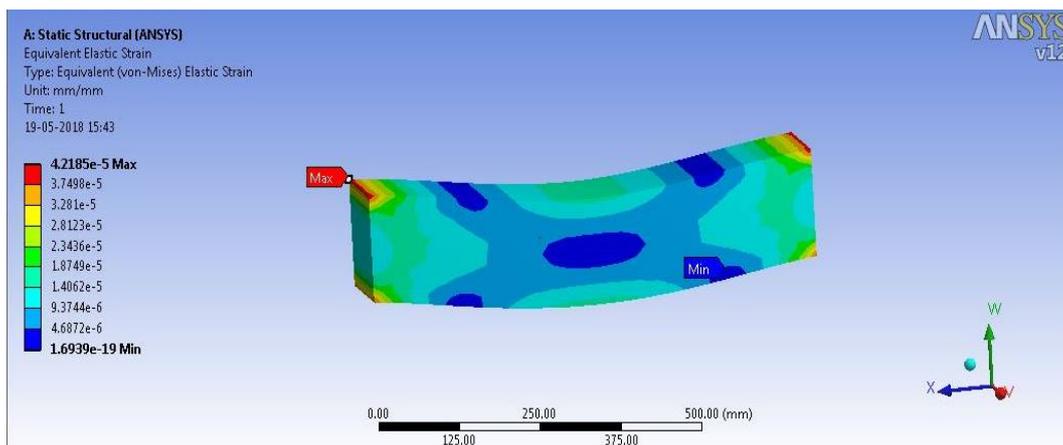
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3.8 Flow chart with Flexural strength value strength value 28 days



IV. ANSYS SOFTWARE ANALYSIS OF BEAM ELEMENT

4.1 ANALYSING OF FLEXURAL STRENGTH CONCRETE 14 DAYS TEST VALUE FIGURE



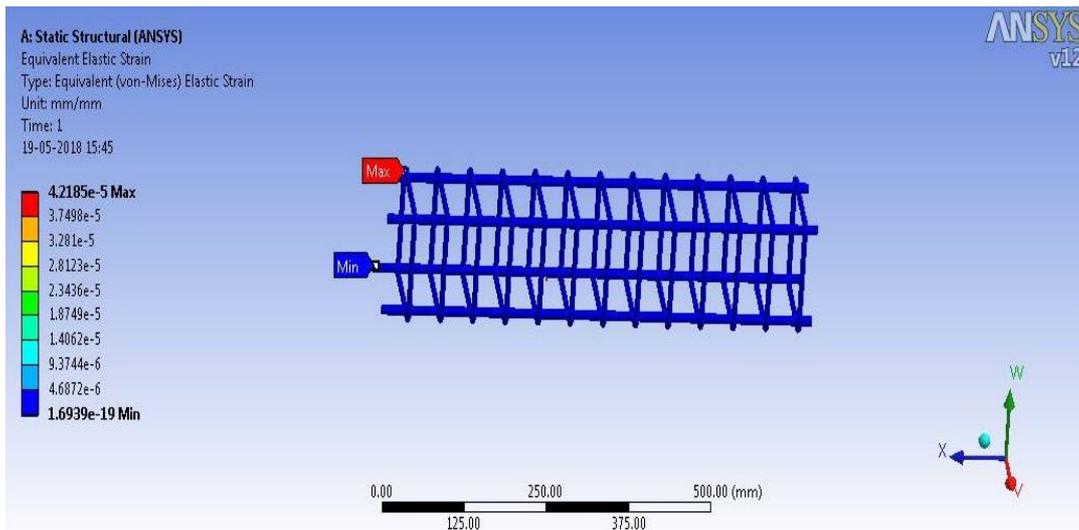
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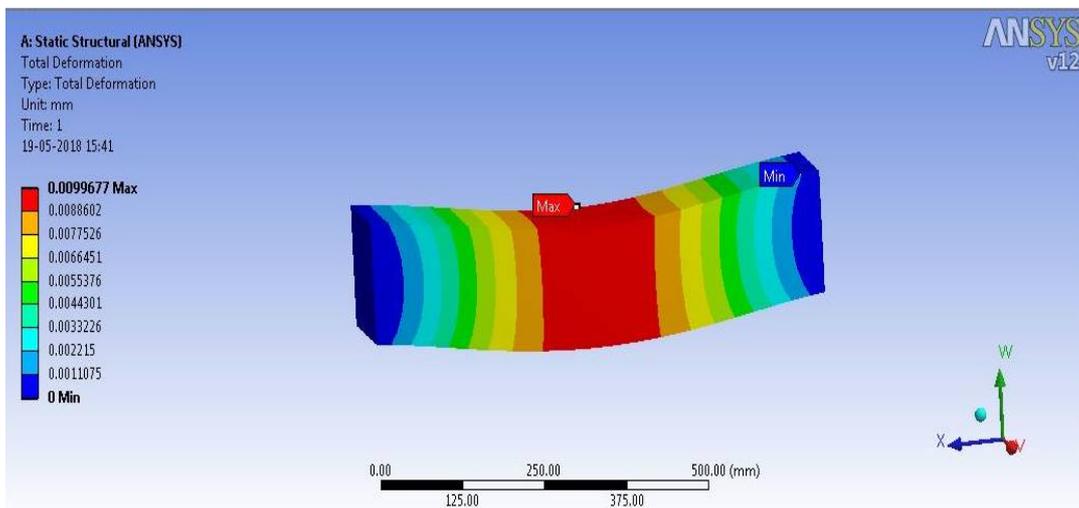
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4.1.1 Flexural strength beam equivalent elastic strain value 14 days



4.1.2 Flexural strength beam equivalent elastic strain value 14 days



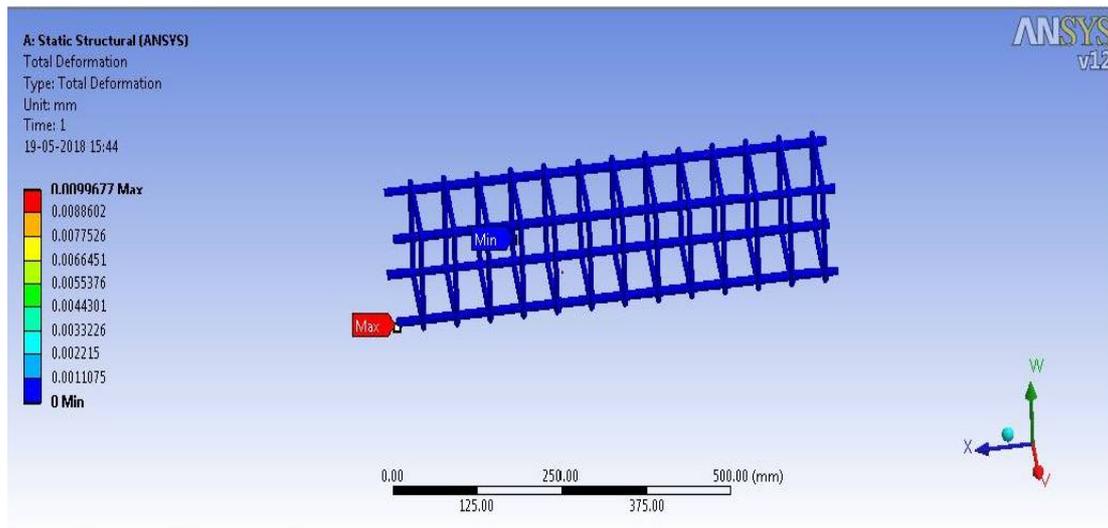
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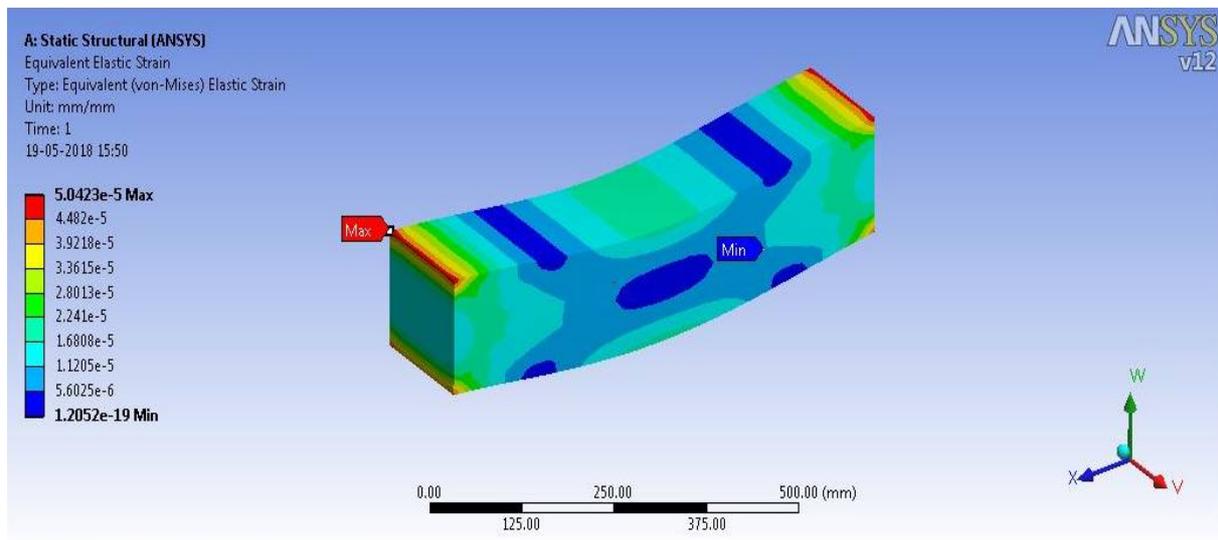
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4.1.3 Flexural strength equivalent total deflection beam 1value 14 days



4.1.4 Flexural strength beam equivalent total deformation beam value 14 days

4.2 ANALYSING OF FLEXURAL STRENGTH BEAM CONCRETE 28 DAYS TEST VALUE FIGURE



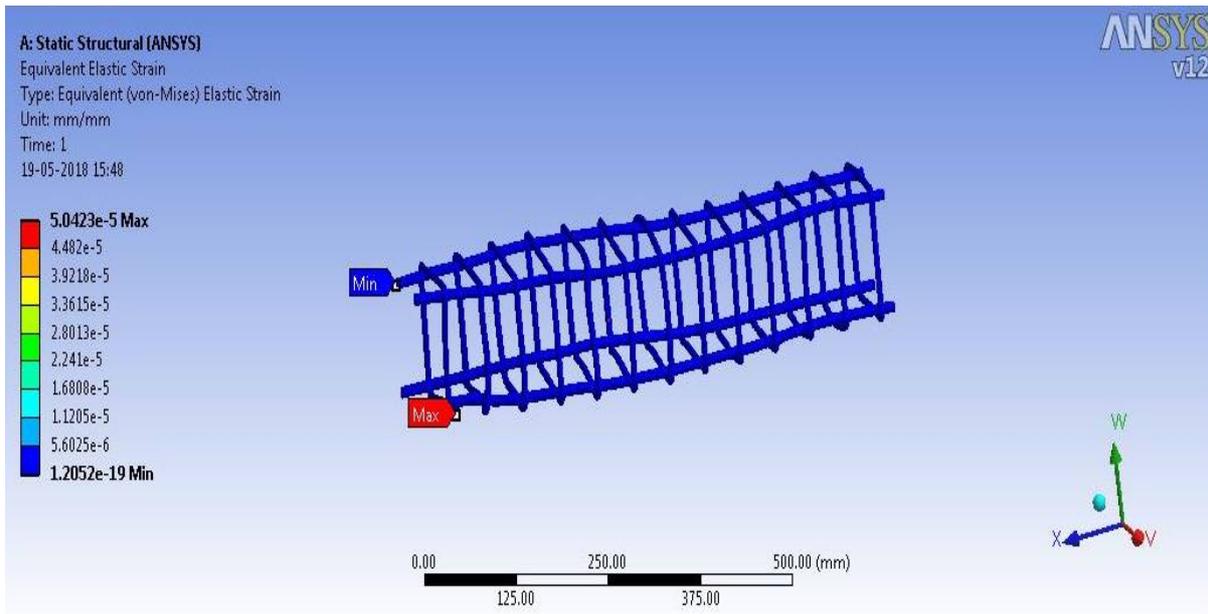
4.2.1 Flexural strength beam conventional concrete equivalent elastic strain value 28 days

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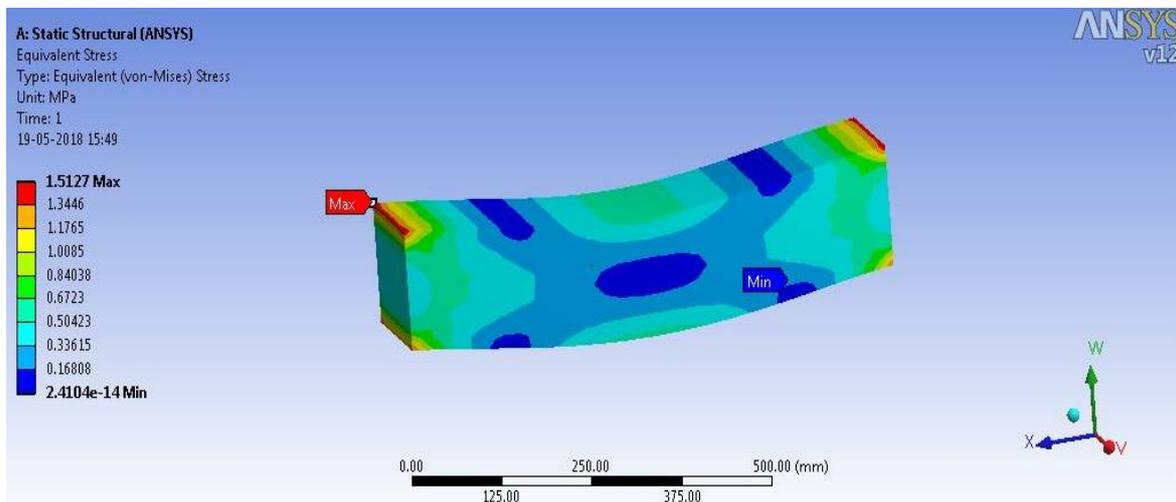
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4.2.2 Flexural strength beam conventional concrete equivalent elastic strain value 28 days



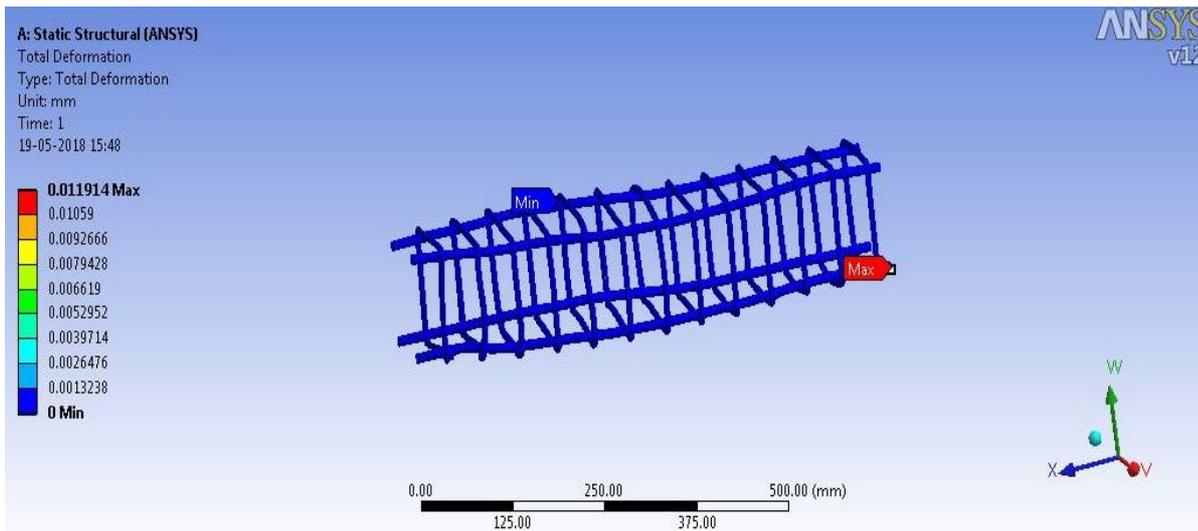
4.2.3 Flexural strength equivalent total deflection beam value 28 days

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4.2.4 Flexural strength equivalent total deformation beam value 28 days

V. CONCLUSION

The design and experimental behaviour of spandex fibre reinforced concrete beams has been presented in this paper. The experimental investigation comprised pin ended loaded fibre reinforced concrete beams has been developed and reported in this paper. From the experimental results the 5% addition of spandex fibre reinforced concrete gives the ultimate strength value of compression, tension and flexural strength and the strength values were compared with conventional concretes of M25 concrete Grade. The composite beam strength load axial strain relationships and failures modes of the beams has priced using experimental reports and compared with ANSYS Software.

REFERENCES

1. A Amit rai dry.pjoshi (2014) application and properties of fibre reinforced concrete
2. A raiypjoshi (2014) application and properties of fibre reinforced concrete
3. Adekunlekf (2015) surface treatments of natural fibres polymer chemistry engineering
4. Arzkhizfz, achaby me, malha m (2015) mechanical and thermal properties of natural fibers reinforced polymer composites: doum/low density polyethylene. journal of materials & design 43: 200 420 -205.
5. Ashikkp, sharmars (2015)a review on mechanical properties of natural fiber reinforced hybrid polymer composite journal of minerals and materials characterization and engineering 420 -426
6. Hossain mr, islama ma, vuureabav, verpoestbi (2013) tensile behaviour of environment friendly jute tensile epoxy laminate composite engineering .782 788
7. Mvmohod (2015) performance of polypropylene fibre reinforced concrete .
8. Randjbaran ,jalil a, abangabdulmajid dl (2014) hybrid composite laminates reinforced with kevlar carbon glass kevlar woven fabric for impact testing .
9. Sa panali p palankar bkumar (2014) comparative study of polymer fibre reinforced concrete with conventional concrete pavement .
10. Sansarihsharma (2017) compaction properties of fiber mix reinforced conventional concrete .
11. Udaykumar pa, ramalingaihrs (2014) studies on effects on short coir fibre reinforcement of flexural properties of polymer matrix
12. Xiangming Zhou harmeet(2017) engineering properties of treated natural hemp fibre reinforced concrete .