sequence of partial sum p_m , $m = 1, 2, 3, \ldots$. The actual procedure used to invert the Laplace Transform consists of using equation (56) together with the $\varepsilon -$ algorithm (Honig and Hirdes [22]).

NUMERICAL RESULTS AND DISCUSSION

To represent and illustrating the analytical results for displacements, temperatures, stresses and perturbation of magnetic and electrical fields which are obtained in the previous sections in the contexts of generalized theories of magneto viscothermoelasticity, we present some numerical results. The material is chosen for the purpose of numerical evaluation is carbon steel for which data is given below:

Table 1: Physical data for carbon steel material.

S. No.	Coefficient	Units	Value	References
1.	ρ	$kg\ m^{-3}$	7.9×10^{3}	[23, 24]
2.	T_0	K	293.1	[23, 24]
3.	λ	Nm^{-2}	9.3×10^{10}	[24, 25]
4.	μ	Nm^{-2}	8.4×10^{10}	[24, 25]
5.	C_e	$J\,kg^{-1}\deg^{-1}$	6.4×10^{2}	[24, 25]
6.	K	$W\,m^{-1}\,K^{-1}$	50	[25, 26]
7.	α_T	$\deg^{-1}$	13.2×10^{-6}	[25, 26]
8.	$\alpha_0 = \alpha_1$	s	6.0×10^{-2}	[25, 26]
9.	H	Am^{-1}	1.0	[24, 25]
10	μ_0	Hm^{-1}	1.3×10^{-6}	[25, 26]

Here the values of thermal relaxation time to have been estimated from the equation (2.5) of Chandrasekharaiah [27] and t_1 is taken proportional to t_0 . The convergence analysis of numerical have been carried out through the Cauchy's general principle of convergence i.e. $|f_{n+1} - f_n| < \varepsilon$; ε being arbitrary small number to be selected at random in order to achieve the desire level of accuracy.

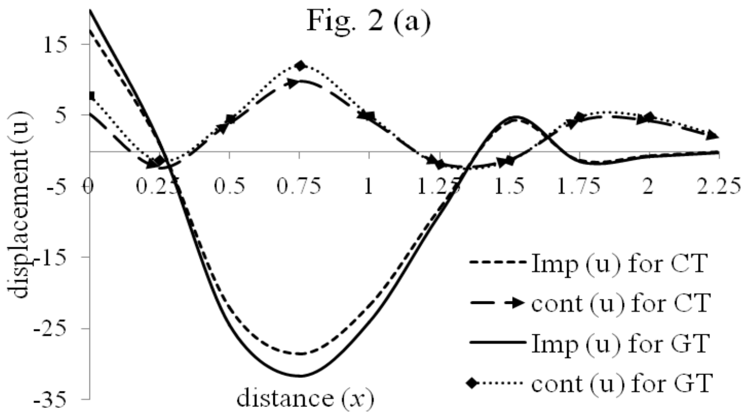

Fig. 2. (a) Horizontal displacement (u) versus epicentral distance (x) .

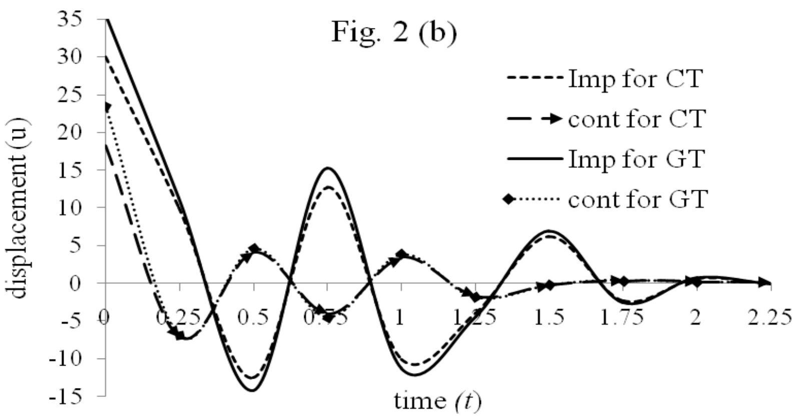

Fig. 2. (b) Horizontal displacement (u) versus non dimensional time (t) .

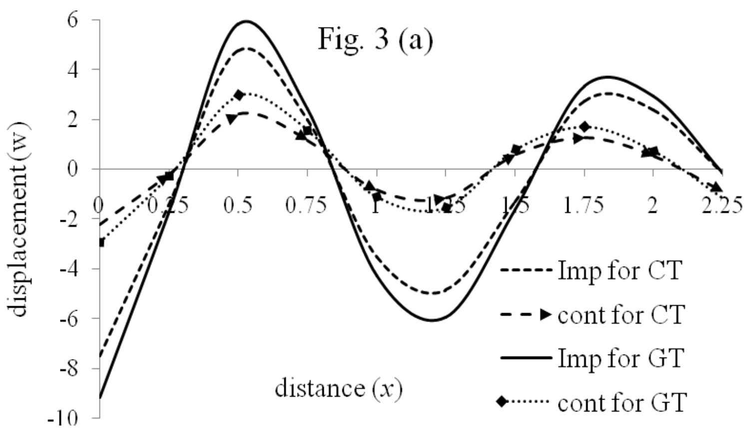

Fig. 3. (a) Vertical displacement (w) versus epicentral distance (x) .

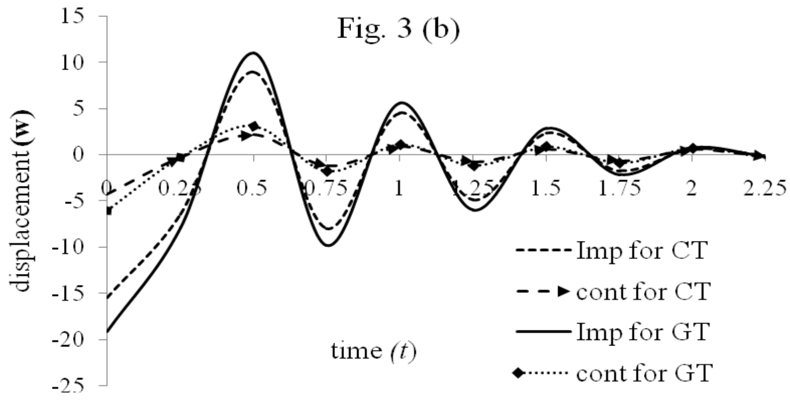

Fig. 3. (b) Vertical displacement (w) versus non dimensional time (t) .

In this paper Figs. 2 to 9 have been presented graphically for thermally insulated boundary conditions. Comparison has been given for coupled thermoelasticity (CT) and generalized thermoelasticity (GT) for impact and continuous loads. Figs. 2(a) and 2(b) have been presented for horizontal displacement (u) versus epicentral distance (x) and non–dimensional time (t) for impact and continuous loading. It can be inferred from these figures that initially the variation of horizontal displacements (u) is large and as we move from the centre point towards epicentral distance (x) and non–dimensional time (t) the vibrations go on decreasing and die out. Figs. 3(a) and 3(b) have been plotted for vertical displacements (w) versus epicentral distance (x) and non–dimensional time (t) for impact and continuous loading. It is revealed from these figures that initially the variations are very low below mean position, then rises and with increase in value of (x) and non–dimensional time (t) the variations go on decreasing and die out.

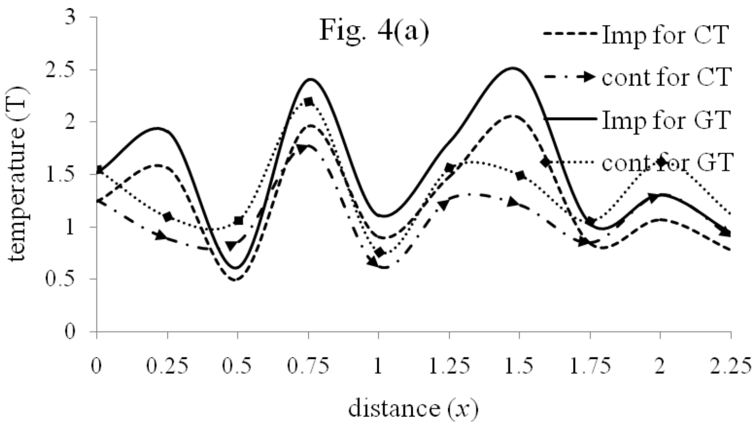

Fig. 4. (a) Temperature change (T) versus epicentral distance (x) .

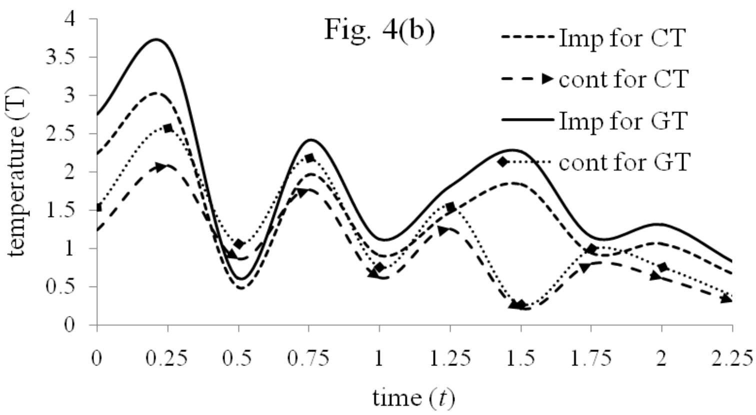

Fig. 4. (b) Temperature change (T) versus non dimensional time (t) .

Figs. 4(a) and 4(b) have been plotted for temperatures (T) versus epicentral distance (x) and non–dimensional time (t) for impact and continuous loading. It is noticed that the variation of temperatures (T) in Fig. 4(a) achieved maximum variation at $x = 1.5$ then become asymptotic with increasing value of (x) . But the Fig. 4(b) shows the high variation in small time and with increase in value of (t) the variation of vibrations go on deceasing and die out. This is to be observed from above discussion that in case of generalized themoelasticity (GT), the behavior is large as compared to coupled thermoelasticity (CT). Figs. 5 and 6 have been plotted for perturbation of magnetic fields $((h_1)$ and $(h_3))$ versus epicentral distance (x) for impact and continuous loading. It can be inferred for these figures that there is a trend of sinusoidal wave type vibrations.

Fig. 7 has been presented for horizontal displacement (u), vertical displacement (w), temperature (T) and perturbation of magnetic fields $((h_1)$ and $(h_3))$ versus resonant frequencies (Ω) for periodical loading. It is noticed from this figure that variation of displacements and temperature is linear until $(\Omega = 1)$ after that increase in resonant frequencies the transient behavior of variations die out at $(\Omega = 1000)$ and in case of perturbation of magnetic fields $((h_1)$ and $(h_3))$, the variation is linear until $(\Omega = 0.01)$ and with increase in value of Ω the variation is die out. From the trends of variations of Fig. 7, it is noticed that with large value of (Ω), the variations of displacements (u) and (w), temperature and perturbation of magnetic fields $((h_1)$ and $(h_3))$ becomes low. On the other hand, with increasing values of (Ω), the variation of displacements, temperature and perturbation of magnetic fields are high. This is due to the effect of resonance.

Figs. 8 shows the comparison of normal stress (σ_{zz}) versus epicentral distance (x) with and without magnetic field $(\boldsymbol{H} = \boldsymbol{H}_0 + h)$ respectively for coupled thermoelasticity (CT) and gereralized thermoelasticity (GT) have been plotted for thermally insulated boundary conditions for impact and continuous loads. It can be inferred from Figs. 8 that the vibrations initially rises, achieved maximum variation at $(x = 0.25)$ and with increase in value of (x) the vibrations go on decreasing and die out. Here the vibrations in presence of magnetic field, the variations are low, while in absence of magnetic field the variations are high.

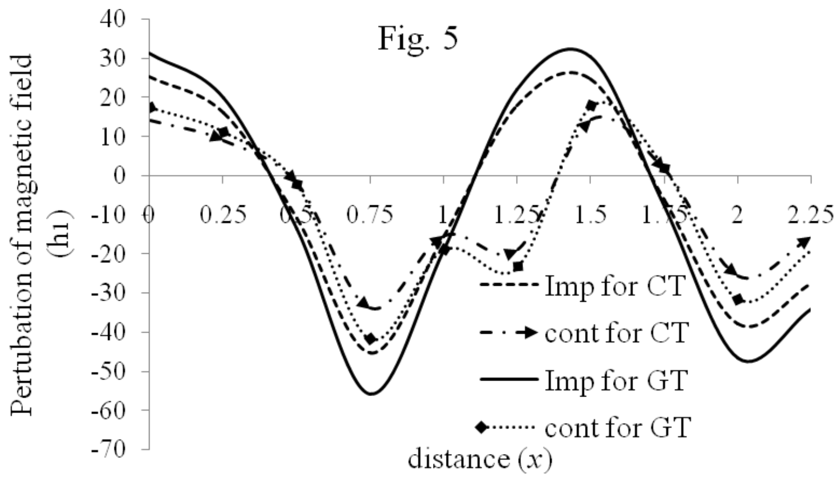

Fig. 5. Perturbation of magnetic field (h_1) versus epicentral distance (x).

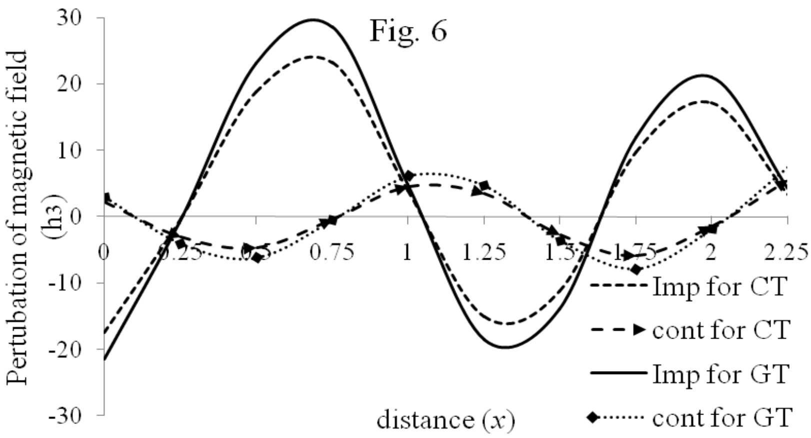

Fig. 6. Perturbation of magnetic field (h_3) versus epicentral distance (x) .

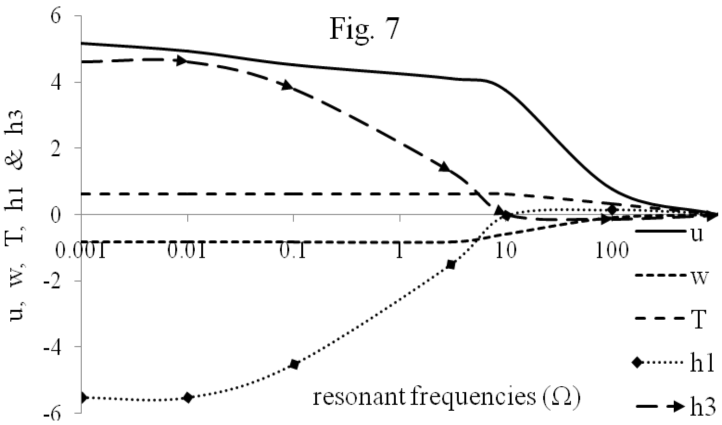

Fig. 7. Variation of displacements, temperature and perturbation of magnetic fields $\left((h_1) \text{ and } (h_3)\right)$ versus resonant frequencies (Ω) .

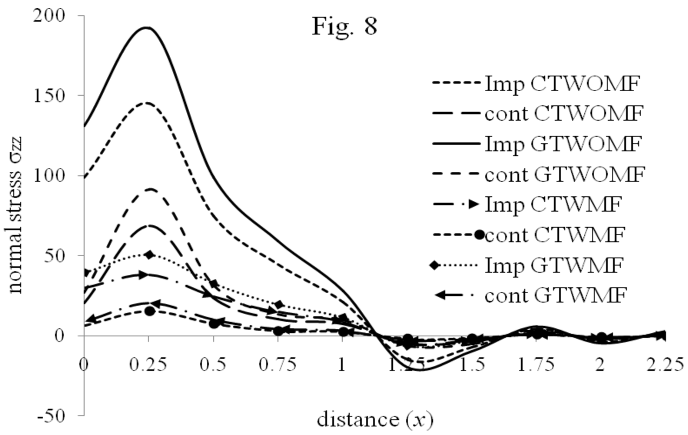

Fig. 8. Normal stress distribution (σ_{zz}) versus epicentral distance (x) .

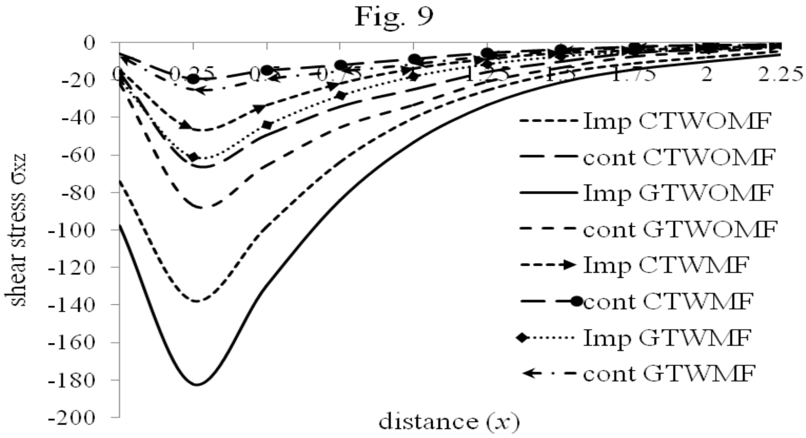

Fig. 9. Shear stress distribution (σ_{xz}) versus epicentral distance (x) .

Figs. 9 shows the comparison of shear stresses (σ_{xz}) versus distance (x) with and without magnetic field $(\boldsymbol{H} = \boldsymbol{H}_0 + h)$ respectively have been presented for impact and continuous loads. It is noticed from this Fig. 9 that the variation of vibrations is initially decreasing and achieved maximum variation $(x = 0.25)$ with increase in epicentral distance (x) the variations increases and die out with increasing the value of (x) . Here the variation is meager in the presence of magnetic field, where as the variations are large without magnetic field. This shows that effect of magnetic field. The effect of perturbation on electric fields has found negligible in case of temperature, viscous effects and strip load.

CONCLUDING REMARKS

This paper studied the magneto viscothermoelastic half space in forced vibrations of mechanical strip loadings in thermally insulated and isothermal boundary conditions. The analytical and numerical results permit some concluding remarks:

1. The problem has been investigated with the help of non classical theories of thermoelasticity based on Lord Shulman (LS) and Green Lindsay (GL).
2. The values of physical functions converge to zero with increase in distance (x) and in the context of generalized theories of thermoelasticity and all functions are continuous.
3. The problem have been analyzed and investigated with the help of three types of loads i.e. impact loading, continuous loading and periodic loading.

Perturbation of electric fields is independent of temperature, loading and viscous effects.

4. Effect of periodic loading has been shown for resonant frequencies. The Fig. 7 clearly shows that with increase in resonant frequencies, the variation of displacements, temperature and perturbation of magnetic fields die out. As the resonant frequencies are low, higher is the variation and with increase in resonant frequencies, lower the variations.
5. In case of stresses, the variation is high without magnetic field and low with magnetic field. Perturbation of magnetic fields is dependent on temperature and loading. As the perturbation of magnetic field increases the variation of stresses decreases. This clearly indicates the effect of magnetic field on stresses.
6. The present theoretical results may provide interesting information and mathematical foundation for working on the subject, because the increasing interest in the theory of thermoelasticity has many engineering applications such as magnetic storage elements, structural elements and corresponding measurement techniques of magneto viscothermoelasticity which enrich this work.
7. Perturbation of magnetic field is used to reduce high variation of stress analysis. Study may also find useful and wide applications in the design and construction of sensors and other acoustic waves in addition to possible bio industries.

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