CHAPTER-V

NON-LINEAR ANALYSIS OF HEATED POLYGONAL SANDWICH PLATES.

CHAPTER-V

Non Linear Analysis of Heated Polygonal Sandwich Plates[6].

5.1 ABSTRACT

This paper represents non linear analysis polygonal sandwich plates with simply supported edges following well known Berger Equation (7) . Conformal mapping technique has been employed. Numerical results of different polygons are computed and shown in graphs. Results of the square plates are compared with the known results. Results for other polygons are believed to be new.

5.2 Introduction

Determination of thermal stresses in sandwich plates is attractive to the design engineers in view of their wide applications in structural design. Several authors have investigated different problems of sandwich plates among which the works of Wang, Reissner, Eringen and Hoff need special mention. Wang[53] presented a general theory of large deflections of sandwich plates and shells.

Reissner [45]presented an exact analysis of finite deflections of sandwich plates . Eringen and Hoff individually presented a theory for bending and buckling of rectangular sandwich plates under mechanical loading only.

Determination of thermal stresses in sandwich plates is gaining momentum day by day because of their importance in space industry. Literature in this area is very scanty. Only two papers could be located in this field where Kamiya used Berger type equation in investigate large deflections of heated sandwich plates.

Later Roy, Dutta and Banerjee(43) quite elegantly analyzed the same problem following Banerjee's hypothesis (13). All these investigations are concerned with plates of rectangular shapes only. It is noteworthy that heated sandwich plates of irregular shapes have not received much attention. The aim of the present paper is to study the large deflection behavior of heated sandwich polygonal plates.

Berger's equations have been employed in the investigations along with the conformal mapping technique numerical results of different polygonal

Sandwich plates are shown in graphs. Results of the square plates are compared with the available results. Results of other polygons are believed to be completely new.

5.3. Governing Equation

Consider a sandwich plate with an isotropic core as well as an isotropic upper and lower faces. The faces are assumed to respond to the bending and membrane actions of the plate while the core is assumed to transfer only shear deformations . Further, the thickness of upper and lower faces is sufficiently thin in comparison with core thickness ($h >> t$) to ignore a variation of stress in the thickness direction of the faces.

Under thermal loading the governing differential equation w is as follows [43] .

$$\frac{2E^f tA}{1-\nu^{f^2}}\nabla^4 w + hG^c\nabla^4 w - (1+\nu^f\ )\alpha^f G^c\nabla^2 f - \frac{4G^c A}{h}\nabla^2 w = 0$$

----(5.1)

With

$$\frac{1}{2}[\frac{\partial w}{\partial x}]^2 + \frac{1}{2}[\frac{\partial w}{\partial y}]^2 - (1+\nu^f\ )\alpha^f T_0^m = A = Cons\tan t \qquad ....(5.2)$$

Equation (5.1) can be put in the following convenient form

$$\nabla^4 w - \lambda_1^2\nabla^2 w = \lambda_2^2\nabla^2 f \qquad ....(5.3)$$

Where,

$$\lambda_1^2 = (4G^c A/h)/[2E^f tA/(1-\nu^{f^2}) + hG^c]$$

$$\lambda_2^2 = (1+\nu^f)\alpha^f G^c)/[2E^f tA/(1-\nu^{f^2}) + hG^c]$$

For simply supported polygonal plates equation (5.3) takes the following simple form (51)

$$\nabla^2 w - \lambda_1^2 w = \lambda_2^2 f \qquad .....(5.4)$$

By changing equation (5.4) into a complex coordinates ($\xi,\bar{\xi}$) by the transformation

$z = x + iy$ and $\bar{z} = x - i\bar{y}$

we get

$$\frac{\partial^2 w}{\partial\xi\partial\bar{\xi}} - \lambda_1^2(\frac{dz}{d\xi}\frac{d\bar{z}}{d\bar{\xi}})w(\xi,\bar{\xi}) = \lambda_2^2 f(\xi,\bar{\xi}) \qquad ....(5.5)$$

Whereas equation (5.2) is transformed into

$$A\frac{dz}{d\xi}\frac{d\bar{z}}{d\bar{\xi}} = 2\frac{\partial^2 w}{\partial\xi\partial\bar{\xi}} - (1+\nu^f\ )\alpha^f T_0^m\frac{dz}{d\xi}\frac{d\bar{z}}{d\bar{\xi}}$$

Where

$$\xi = re^{i\theta} \quad \text{and} \quad \bar{\xi} = re^{-i\theta}$$

Equation (5.5) is solved by applying modified Galerkin's technique. If we consider one term of the mapping function

$$z = f(\xi,\bar{\xi})$$

With

$$\frac{dz}{d\xi} = \frac{d\bar{z}}{d\bar{\xi}} = \text{Constant=}L_1 \text{ (say)}$$

Equation (5.5) reduces to

$$\frac{\partial^2 w}{\partial\xi\partial\bar{\xi}} - \lambda_1^2 L_1^2 w(\xi,\bar{\xi}) = \lambda_2^2 L_2^2 f(\xi,\bar{\xi})$$

It is evident that $I_0(2\lambda_1 L_1\sqrt{\xi\bar{\xi}})$ is a solution of the equation

$$\frac{\partial^2 w}{\partial\xi\partial\bar{\xi}} - \lambda_1^2 L_1^2 w = 0 \qquad \text{.....(5.6)}$$

Since the general solution of the equation (5.55) is θ dependent , we can assume the solution of equation (5.5) in the following form

$$w = w_0 J_0(2\lambda_1 L_1\sqrt{\xi\bar{\xi}})S(\xi\bar{\xi})$$

Where, $\quad f = f_0 J_0(2\lambda_1 L_1\sqrt{\xi\bar{\xi}})S(\xi\bar{\xi})$

And $\quad S(\xi,\bar{\xi}) = (\xi^2+\bar{\xi}^2)\left\{1+\frac{(\xi^2+\bar{\xi}^2)}{2^2}+\frac{(\xi^2+\bar{\xi}^2)^2}{3^2}-\frac{(\xi^2+\bar{\xi}^2)^3}{4^2}\right\}$ ....(5.7)

Here W_0 is a constant and $2\lambda_1 L_1$ is a root of $J_0(2\lambda_1 L_1) = 0$.

This implies that deflection 'w' is zero at the boundary of the unit circle and f=0 at the boundary. Substitution of relation (5.7) in (5.5) yields the error function $\in(\xi\bar{\xi})$ Galerkin's technique requires that

$$\iint_{s} \in(\xi\bar{\xi})w(\xi\bar{\xi})ds = 0 \qquad \text{.......(5.8)}$$

After evaluating the integrals in equation (5.8) and keeping in mind the mapping Function.

$$z = L_1\xi + L_2\xi^5;$$

$$\bar{z} = L_1\bar{\xi} + L_2\bar{\xi}^5;$$

$$\xi\bar{\xi} = r^2 \qquad \text{.......(5.9)}$$

[L_1 , L_2 are given in separate Table 1 having different values for different polygons].

We get the following cubic equation

$$\left[\frac{w_0}{h}\right]^3 + P\left[\frac{w_0}{h}\right] + Q\left[\frac{f_0}{T_0^m}\right] = 0 \qquad \text{....(5.10)}$$

Where P, Q are constants containing the mapping function coefficient L_1 and L_2 .

The values of A from equation (5.6) have been evaluated through integration over the whole area of the unit circle. Calculations have been carried out with the help of the following flow chart.

5.4 Flow chart

1.Read E^f, t,h,a,G^c ,$\frac{f_0}{T_0^m}$,L_1,L_2

2 ,Set No = 0

3.Find $\frac{\partial w}{\partial \xi}, \frac{\partial w}{\partial \bar{\xi}}, \frac{\partial^2 w}{\partial \xi \partial \bar{\xi}}$

4.Find $\int_0^1 r^m J_n^2(2\lambda_1 L_1 r)dr, \int_0^1 r^m J_m(2\lambda_1 L_1 r)dr$

5. Find A

6. Find P & Q

7. If R > R_{min} Go to step 8, otherwise step 9.

8. Set No = No. + 1 Go to step 3

9. Print W_0/h, T_0^m

10. Stop

5.5 Numerical Calculations

The following data have been assumed for numerical calculations

a = 0.254 meter

h = 1.7135E –2 meter

t = 0.635E-3 meter

E^f = 7347.201E + 6kg/m^2

G^c = 4218.4884E3 kg/m^2

ν^f = 0.3

The following table E shows the mapping function coefficients for different polygons

TABLE-E

Shape of the plate	Mapping Function Coefficients	Mapping Function Coefficients
	(L_1)	(L_2)
Circle(_Polygon of infinite sides)	1.0a	0.0
Octagon	1.022a	-0.028a
Heptagon	1.029a	-0.036a
Hexagon	1.038a	-0.05a
Pentagon	1.053a	-0.07a
Square	1.08a	-0.11a
Triangle	1.135a	-0.15a

Table F . Numerical results of the maximum deflections of the different simply supported polygonal sandwich plates with immovable edges.

TABLE- F

Shape of the Plate(Curve no.)	Thermal Load $((F_0 / T^m)$	Central Deflection Parameter (W_0 / h)	Remarks Known(43)
TRIANGLE (1)	-5.0	0.3872340	
	-8.0	0.5316897	
	-10.0	0.6080588	
SQUARE (2)	-5.0	0.37642230	0.37642230
	-8.0	0.5127195	0.52232230
	-10.0	0.58688046	0. 60010830
PENTAGON (3)	-5.0	0.3654937	
	-8.0	0.5016606	
	-10.0	0.5736317	
HEXAGON (4)	-5.0	0.3619153	
	-8.0	0.4962337	
	-10.0	0.5671843	
HEPTAGON (5)	-5.0	0.3609137	
	-8.0	0.4942315	
	-10.0	0.5646010	
OCTAGON (6)	-5.0	0.3591899	
	-8.0	0.4917436	
	-10.0	0.5616988	
CIRCLE (7)	-5.0	0.3558740	
	-8.0	0.4862973	
	-10.0	0.5550618	

5.6. Observations and Conclusions

1. Numerical results have been plotted in graphs showing central deflection parameter (W_0 / h) versus thermal load (f_0 / T^m).

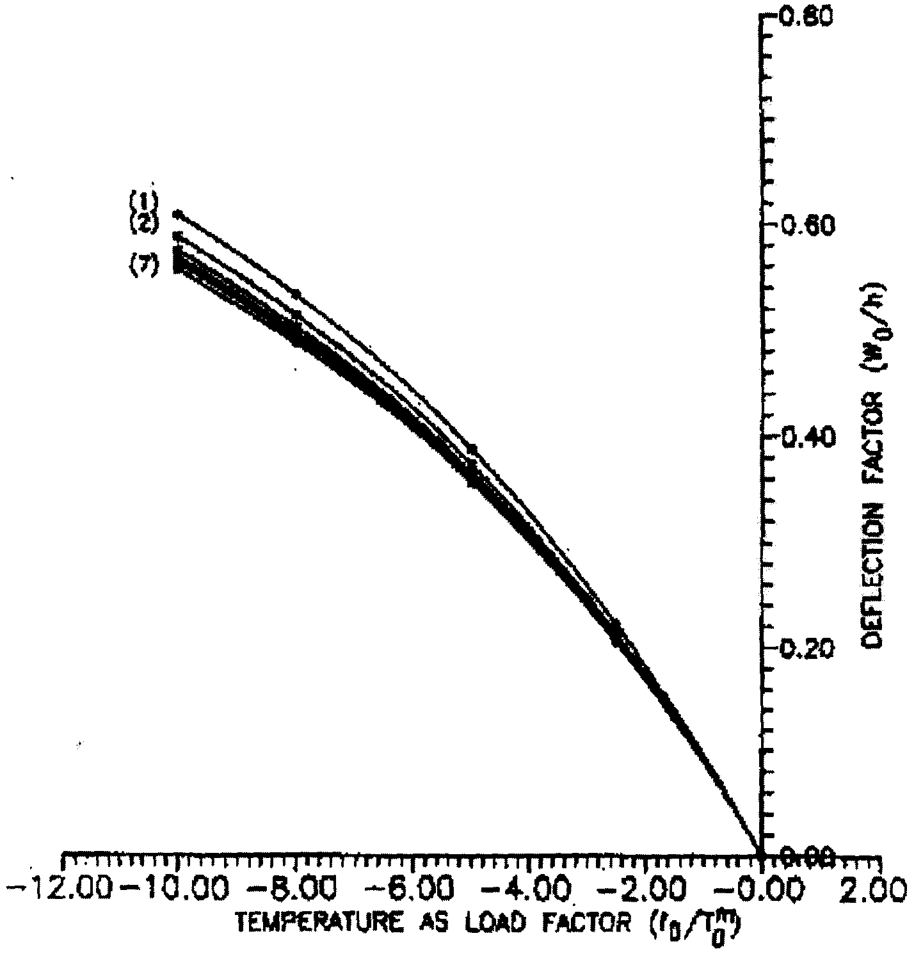
2. The results of the present study for square plate have been compared with those of (43) and found to be in good agreement.

3. The results of the other polygons are believed to be completely new.

4. The figures exhibit an interesting point noteworthy for the design engineers.

It is needless to mention that as number of sides of a regular polygon the load-deflection curve will tend to that of a circle.

Polygons of minimum sides i.e. equilateral triangle have the minimum area with side 2a. Polygons of infinite sides i.e. , circle have maximum area with radius 'a' . The graph shows that for the same load deflection parameter (w_0 / h) is maximum for triangle and minimum for circle. The results of other polygons lie between two values. Therefore it can be concluded that sandwich plates of maximum area i.e. circle having minimum defection i.e. minimum stresses are most acceptable for design.



(1)
(2)
(7)
0.80
0.60
0.40
0.20
0.00
DEFLECTION FACTOR (w_0/h)
-12.00 -10.00 -8.00 -6.00 -4.00 -2.00 -0.00 2.00
TEMPERATURE AS LOAD FACTOR (t_0/T_0^m)

CHAPTER-VI

LARGE AMPLITUDE FREE VIBRATIONS OF THICK POLYGONAL PLATES PLACED ON WINKLER TYPE FOUNDATION

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LARGE AMPLITUDE FREE VIBRATIONS OF THICK POLYGONAL PLATES PLACED ON WINKLER TYPE FOUNDATION [5]

6.1 ABSTRACT:-

This paper represents an investigation on the non linear dynamic response of thick polygonal plates placed on winkler type foundation. Berger's approximation [7] along with conformal mapping technique has been employed in the investigation. The case of simply supported square plates has been studied in detail and compared with the known results. The results of other polygons are believed to be new.

6.2 INTRODUCTION:-

The study of the non linear dynamic behaviours of moderately thick plates is gaining momentum day by day due to its wide application in modern design. Several authors worked in this field.Wu and Vinson [55] used Berger type equations to study the non linear behaviours of thick rectangular plates whereas Kanaka Raju and Venkateswara [56] applied the finite element method to investigate the large amplitude vibrations of thick plates. Sathyamoorthy and Chia [47] treated quite elegantly some interesting non-linear problems of moderately thick plates. The analytical work so far carried out is based mainly on single mode approximations and is often done with the help of either Von Karman type non-linear equation or Berger's approximation.

Recently R.Bhattacharya and B. Banerjee have offered a new hypothesis [16,17] to study non linear behaviours of thick plates.The cases of rectangular,circular and polygonal thick plates have been studied by the authors in detail. Numerical results presented by the authors both for movable and immovable edges are attractive for practical purposes.

Study of the non-linear response of elastic plates placed on elastic foundation of the winkler type is an important chapter for design engineers. Important works in this field are due to B.Banerjee & S.Dutta [23] and R.Bhattacharya & B.Banaerjee [16].All these authors have analysed quite elegantly the non-linear responses of thin as well as thick plates placed on elastic foundation of winkler type under different types of loading.

The aim of the present project is to study the non-linear dynamic response of thick polygonal plates placed on winkler type foundation. Berger's approximation in conjunction with conformal mapping technique has been employed in the investigation. The effect of shear deformation of the thick polygonal plates for different values of foundation modulus have been studied carefully.Numerical results for each polygon have been given in tabular forms. The results of the square plates have been compared with known results [7]. The results of other polygons are believed to be completely new.

6.3 ANALYSIS:-

Let us consider large amplitude free vibrations of thick square plates of thickness "h" and edge length "2a" . The material is transversely isotropic. The origin of the coordinates is located at the center of the plate. The deflections are considered to be of the same order of magnitude as the plate thickness. Following Wu and Vinson [55], Ariman [52] and Bhattacharya and Banerjee [17],the differential equation for the thick plates placed on elastic foundation of the winkler type can be written as

$$\left[(\nabla^4 w_1)/w_1 - \{(h^2/10)(k_1/D)(2-\nu)/(1-\nu)(\nabla^2 w_1/w_1) + (k_1/D)\}\right]\tau(t)$$
$$+\left[12/(h^2 c_\rho^2) - (6/5)(\rho/G_c)(\nabla^2 w_1)/w_1\right]\ddot{\tau}(t)$$
$$+\{\alpha^2 h^2/\{10(1-\nu^2)\}(E/G_c\ )(\nabla^4 w_1)/w_1 - \alpha^2(\nabla^2 w_1)/w_1]\tau^3(t) = 0\} \quad \ldots\ldots(6.1)$$

where

$$\tau^2(t)\alpha^2 h^2/12 = \frac{1}{2}[\{\partial w_1/\partial x\}^2 + \{\partial w_1/\partial y\}^2] \qquad \ldots\ldots(6.2)$$

A solution of equation (6.1) is possible if

$$(\nabla^4 w_1)/w_1 = \lambda_1^4 \text{ and } (\nabla^2 w_1)/w_1 = -\lambda_1^2 \qquad \ldots\ldots(6.3)$$

This implies $(\nabla^2 + \lambda_1^2)(\nabla^2 + \lambda_1^2)w_1 = 0$ ...... (6.4)

Let $w_1 = w_1^{'} + w_1^{''}$;

Then $(\nabla^2 + \lambda_1^2)w_1^{'} = 0$ and $(\nabla^2 + \lambda_1^2)w_1^{''} = 0$ ....(6.5)

Transforming equation (6.5) into $(\xi, \bar{\xi})$ coordinates and keeping one term of the mapping function with

$$\delta Z/\delta\xi = \delta\bar{Z}/\delta\bar{\xi} = L_1$$

where, $Z = L_1\xi + L_2\xi^5$ and $\bar{Z} = L_1\bar{\xi} + L_2\bar{\xi}^5$ ...... (6.6)

it can be written

$$\{\partial^2 w_1^{'}/\partial\xi\partial\bar{\xi}\} + (\lambda_1^2/4)L_1^2 w_1^{'} = 0 \qquad \ldots\ldots(6.7)$$

and

$$\{\partial^2 W_1^{''}/\partial\xi\partial\bar{\xi}\} + (\lambda_1^2/4)L_1^2 W_1^{''} = 0 \qquad \ldots\ldots(6.8)$$

This given

$$w_1 = w_1^{''} + w_1^{''} = A_1 J_0(2pr) + A_2 I_0(2pr) \qquad \ldots\ldots.(6.9)$$

where $p = L_1\lambda_1/2$ and $\xi\bar{\xi} = r^2$

For simple support $w_1 = 0$ at r=1 and

$\delta^2 W_1 / \delta\zeta\delta\xi = 0$ at r=1

This implies the frequency equation,

$$\begin{vmatrix} J_0(2p) & I_0(2p) \\ -p^2 J_0(2p) & p^2 I_0(2p) \end{vmatrix} = 0 \qquad \text{....(6.10)}$$

This gives $J_0(2p)I_0(2p) = 0$ i.e., $J_0(2p) = 0$, i.e., 2p=2.4 ..(6.11)

It is clear that a complete solution of equation (6.3) can be got if only

$$\nabla^2 w_1 + \lambda_1^2 w_1 = 0 \qquad \text{....(6.12)}$$

can be solved.

Keeping all terms of the mapping function in equation(6.12) which can be written in $(\xi, \bar{\xi})$ coordinates as

$$(\partial^2 w_1 / \delta\xi\partial\bar{\xi}) + (\lambda_1^2 / 4)(dZ / d\xi)(d\bar{Z} / d\bar{\xi})w_1 = 0 \qquad \text{.....(6.13)}$$

Clearly the general solution of the equation (6.13) is θ dependent. Keeping in mind the solution given in (6.9) we can assume the solution of equation (6.13) in the form

$$w_1 = B\tau(t)J_0(2pr)(\xi^2 + \bar{\xi}^2)[1 + (\xi^2 + \bar{\xi}^2) + (\xi^2 + \bar{\xi}^2)^2 / 2] \qquad \text{.....(6.14)}$$

where,B is constant ,$\tau(t)$ is a time function and $J_0(2p)=0$ which satisfies that $w_1=0$ at the boundary of the circle. Equation (6.10) also satisfies the other condition of simple support i.e. $\{\partial^2 w_1 / \partial\xi\partial\bar{\xi}\} = 0$ at r=1.

Equation (6.2) now reduces to

$$\tau^2(t)(\alpha^2 h^2/12)\{(dZ/d\xi)(d\bar{Z}/d\bar{\xi})\}^2 = 2(\partial w_1/d\xi)(\partial w_1/d\bar{\xi})(dZ/d\xi)(d\bar{Z}/d\bar{\xi}) \quad .....(6.15)$$

Value of α from the equation (6.15) has been evaluated as usually through integration over the whole area of the unit circle.

Substituting equation (6.14) in the equation (6.13), taking all terms of the mapping functions by using equation (6.6) and applying Galerkin's technique, we have

$$\int\int_s \varepsilon(\xi,\bar{\xi}) w(\xi,\bar{\xi}) ds = 0 \quad ....(6.16)$$

where $\varepsilon(\zeta,\xi)$ is the error function.

After evaluating the integrals in (6.16) we get the final solution in the following form

$$\ddot{\tau}(t) + \alpha_1\tau(t) + \beta_1\dot{\tau}^3(t) = 0 \quad -------(6.17)$$

where $\tau(t)$ is Jaccobi's elliptic function and α_1 and β_1 are functions of mapping coefficients L_1 and L_2 .The equation is a well known Duffing's equation and solved as usually with the aid of initial conditions

$\tau(0)=1$ and $\dot{\tau}(0)=0$ in terms of Jacobi's elliptic function.

The ratio of non-linear time period T^* and linear time period T is given by $T^*/T = [(2K/\pi)/\gamma(1+(\beta_1/\alpha_1)(B/h)^2\}]$

Results of the simply supported square thick plates of side 2a have been evaluated and compared with known results[7]. Results of other polygons are calculated and believed to be completely new .

6.4 NUMERICAL RESULTS

The numerical results are here presented in the tabular forms for thick square plates placed on winkler type foundation and compared with known results. The results of other polygons are also presented but can not be compared in absence of any known results.

The ratios of the non-linear time period T^* of vibrations (including the effects of transverse shear deformation ,rotary inertia and foundation modulus) to the corresponding linear period of different polygonal plates (without transverse shear and rotary inertia) are computed for thickness parameter (h/2a = 1/10) and material constants [ν =0.3, $K(E/G_c)$=2.5] at different non-dimensional amplitude parameter [B / h]

Values of the Ratio of the non-linear to linear time period (T^*/ T)

[ν = 0.3, h/2a =0.1, E /Gc =2.5]

TABLE – G
(Equilateral Triangular plate)

Mapping Coefficient L_1=1.11a, L_2 = -0.15a

B/h	Without Elastic foundation $k_1 a^4/D = 0$	With Elastic Foundation 10	15	20
0.2	0.9445140	0.9447159	0.9448165	0.9449166
0.4	0.9109790	0.9113540	0.9115402	0.9117256
0.6	0.8622393	0.8628311	0.8631252	0.8634178
0.8	0.8055148	0.8036102	0.8067054	0.8070990
1.0	0.7467428	0.7476971	0.7481716	0.7486441

TABLE - H (Square plate)

Mapping coefficient L_1=1.08a , L_2= -0.11a

	Present Study	Known [17]	Present Study	Known [17]	Present Study	Known [17]	Present Study	Known [17]
0.2	.9394	.9772	.9396	.9836	.9397	.9856	.9398	.9872
0.4	.9012	.9175	.9017	.9391	.9019	.9461	.9022	.9517
0.6	.8469	.8353	.8476	.8768	.8480	.8878	.8484	.9003
0.8	.7850	.7564	.7860	.8076	.7865	.8258	.7870	.8408
1.0	.7224	.6793	.7236	.7387	.7241	.7608	.7247	.7793

TABLE - I
(Pentagonal plate)
Mapping Coefficient L_1=1.053a, L_2= -0.07a

B/h	Without Elastic foundation k_1 a^4/D = 0	With Elastic foundation		
		k_1 a^4/D = 10	k_1 a^4/D = 15	k_1 a^4/D = 20
0.2	0.9341319	0.9344278	0.9345747	0.9347208
0.4	0.8910983	0.8916820	0.8919713	0.8922589
0.6	0.8309453	0.8318606	0.8323144	0.8327655
0.8	0.7640954	0.7652887	0.7658806	0.7664694
1.0	0.6979418	0.6993235	0.7000095	0.7006922

TABLE - J
(Hexagonal plate)
Mapping Coefficient L_1=1.038a, L_2 = -0.05a

B/h	Without Elastic foundation k_1 a^4/D = 0	With Elastic foundation		
		k_1 a^4/D = 10	k_1 a^4/D = 15	k_1 a^4/D = 20
0.2	0.9315129	0.9318376	0.9319987	0.9321589
0.4	0.8858907	0.8865405	0.8868625	0.8871823
0.6	0.8227923	0.8238083	0.8243117	0.8248121
0.8	0.7535152	0.7548288	0.7554802	0.7561279
1.0	0.6857528	0.6872602	0.6880082	0.6887525

TABLE – K
(Heptagonal plate)
Mapping Coefficient L_1=1.029a , L_2 = -0.036a

B/h	Without Elastic foundation k_1 a^4/D = 0	With	Elastic	foundation
		k_1 a^4/D = 10	k_1 a^4/D = 15	k_1 a^4/D = 20
0.2	0.9297257	0.9300739	0.9302465	0.9304181
0.4	0.8822929	0.8829966	0.8833449	0.8836911
0.6	0.8171753	0.8182729	0.8188165	0.8193567
0.8	0.7462780	0.7476889	0.7483882	0.7490834
1.0	0.6774786	0.6790877	0.6798859	0.6806800

TABLE – L
(Octagonal plate)
Mapping Coefficient L_1=1.022a, L_2= -0.028a

B/h	Without Elastic foundation k_1 a^4/D = 0	With	Elastic	foundation
		k_1 a^4/D = 10	k_1 a^4/D = 15	k_1 a^4/D = 20
0.2	0.9286792	0.9290392	0.9292175	0.9293950
0.4	0.8801695	0.8809014	0.8812636	0.8816233
0.6	0.8138670	0.8150067	0.8155710	0.8161316
0.8	0.7420353	0.7434952	0.7442187	0.7449379
1.0	0.6726518	0.6743109	0.6751336	0.6759523

TABLE - M(Circular plate)
Mapping Coefficient L_1=1.000a, L_2= -0.0a

B/h	Without Elastic foundation k_1 a^4/D = 0	With	Elastic	foundation
		k_1 a^4/D = 10	k_1 a^4/D = 15	k_1 a^4/D = 20
0.2	0.9251383	0.9255464	0.9257485	0.9259494
0.4	0.8728979	0.8737429	0.8741607	0.8745754
0.6	0.8025781	0.8038865	0.8045337	0.8051764
0.8	0.7276708	0.7293267	0.7301468	0.7309616
1.0	0.6564389	0.6582978	0.6592194	0.6601357

6.5 OBSERVATIONS AND CONCLUSIONS

1) It has been observed from the present study that

a)for same foundation modulus $k_1 a^4/D$ and E/Gc, T^*/T decreases as B/h increases.

b) The results of the present study are in very good agreement with the results presented in [17] for square plates placed on winkler type foundation.

c)The results of other polygons are believed to be new.

2) Polygons of minimum sides i.e. equilateral triangle have the minimum area with side 2a and polygons of infinite sides i.e. circle have the maximum area. The results for minimum area i.e. triangle have maximum ratio. So Equilateral triangular plates having maximum ratio are most acceptable for design.