# MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)

Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad.

## M.Tech II Semester Supplementary Examinations, DECEMBER-2017

SUBJECT: <u>Finite Element Method</u>

Branch/Specialization: **CE/Structural Engg.**

Time: **3 hours**                                              Max. Marks: 60

## PART – A

**Answer All Questions**                         **5 x 4Marks=20 Marks**

1. How will you classify essential and non-essential boundary condition?

2. What are the properties of shape functions?

3. Explain Isoparametric elements?

4. Write about Mindlin's theory of plate bending.

5. Write short notes on Non linearity in structural analysis problems.

## PART-B

**Answer any five of the following questions**          **5 x 8 Marks= 40 Marks**

1. A simply supported beam is subjected to uniformly distributed load over Entire span. Find the bending moment and deflection at the mid span using Rayleigh –Ritz method and compare with exact solution. Use a two term Trial function $y = a_1 \sin(\pi x/l) + a_2 \sin(3\pi x/l)$.

2. Derive shape functions for constant strain triangle element.

3. Explain with an example of each of the following

   a. Sub parametric element

   b. Iso parametric element

   c. Super parametric element

4. Write formulation for 4-noded isoperimetric quadrilateral plate element.

5. Briefly explain the types of non linearity and how to consider the same in analysis Problems.

6. (a)Distinguish between Plane stress and Plane strain Problems.

   (b) List and briefly describe the general steps of finite element method.

7. (a) What are the conditions for a problem to be axisymmetric?

   (b) Analyze the element characteristics of a four node quadrilateral element.

8. (a) Why higher order elements are needed? Determine the shape functions of an eight noded rectangular element.

   (b) Discuss the generation of stiffness matrix and load vector for a beam element.

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## M.Tech II Semester Supplementary Examinations, DECEMBER-2017

SUBJECT: <u>Theory of Plates</u>

Branch/Specialization: **CE/Structural Engg.**

Time: **3 hours**                                                    Max. Marks: **60**

## PART – A

**Answer All Questions**                                    **5 x 4Marks=20 Marks**

1. Give the relationship between moments and curvature of pure bending of plates.
2. write down the Assumptions Derivation of governing differential equation for thin plates
3. Derive the Relations between slope, deflection, moments and curvature of a circular plate.
4. Write the Governing differential equation of Plates on Elastic Foundations.
5. write a notes on finite difference method of plates.

## PART-B

**Answer any five of the following questions**                **5 x 8 Marks= 40 Marks**

1. Find cylindrical bending of uniformly loaded rectangular plates with fixed edges?

2. Find maximum and minimum   deflection of a simply supported rectangular plate under sinusoidal   load?

3. a) Derive an expression for deflection of simply supported solid circular plate subjected to an end moments?
   b) Explain correction to the elementary theory of symmetrical bending of circular plates?

4 .Find the deflection equation of plate carrying rows of equidistant columns?

5 a) Governing equation for bending of plate under the combined action of inplane   loading?
   b)Explain about finite difference method with example?

6.a) Obtain solution for plate problem by Ritz method in case of all round simply supported rectangular plate subjected to uniformly distributed load?
   b) Levy's solution for simply supported rectangular and uniformly loaded rectangular plates?

7.a)Derive the differential equation for bending of orthotropic plate?
   b) Write short on application of grid work?

8. **Answer any two of the following**
   a)Derive the slope and curvature of a slightly bent plates
   b)Write a notes on bending of anisotropic plates.
   c) Derive the bending by moments and shearing forces uniformly distributed load for a circular plates.

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## M.Tech II Semester Supplementary Examinations, DECEMBER-2017
### SUBJECT: Advanced Steel Design
Branch/Specialization: CE/Structural Engg.

Time: 3 hours                                                      Max. Marks: 60

## PART – A
**Answer All Questions**                                    5 x 4Marks=20 Marks

1. Define the terms gauge, pitch, edge and end distance of boltjoint?
2. What is the difference between stiffened & unstiffened seat connection?
3. How is the spacing of purlins fixed?
4. What are different types of truss bridges? Explain.
5. Give a brief explanation on types of bunkers.

## PART-B
**Answer any five of the following questions**             5 x 8 Marks= 40 Marks

1. Design a lap joint between two plates of size 100x16mm thick and 100x10mm thick so as to transmit a factored load of 120 kN using a single row of 16mm bolts of grade 4.6 and grade Fe410 plates.

2. A load of 150kN is to be transferred through a bracket plate 12mm thick welded (normal) to the flange of a column section ISHB 300 @ 619 N/m. The load is acting at an eccentricity of 100mm from the column face. Design the connection using 4.6 grade bolts.

3. Design the purlins to support corrugated GI roof sheet of an industrial building to be constructed in Nellore on a plain ground with medium permeability. The purlins are to be spaced at 1.2 m over the roof trusses spaced at 4.5 m and the pitch of the truss is 1/5. Adopt the following data: The size of the building is 16 m x 45 m with the height of eves level is 8 m. The terrain is of category 2.

4. a) What are the different component parts in the truss bridge?
   b) Write briefly about lateral bracing, portal bracing and sway bracing.

5. a) In order to store a specific volume of a material, which will be more economical: bunkers or silos? Please elaborate.
   b) Write the procedure for design of bins

6. a) With neat sketches explain different types of welds.
   b) Write the design procedure for bolted stiffened seat connection.

7. a) What are the functions of an eve strut?
   b) Write about economic proportions of trusses.

8. Write short notes on any **two** of the following
   (a) Draw sectional elevation and plan of a silo and explain its components.
   (b) What Airy's theory tells about the design of Bunkers and Silo.
   (c) What are the advantages of butt joints over lap joints?

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## M.Tech II Semester Supplementary Examinations, DECEMBER-2017

SUBJECT: <u>Retaining Structures</u>

Branch/Specialization: **CE/Structural Engg.**

Time: **3 hours**                                                          Max. Marks: **60**

## PART – A

**Answer All Questions**                                          **5 x 4Marks=20 Marks**

1. What are the advantages of Rankines's method compared to other methods?
2. What are the different modes of failures of retaining walls? Explain with help of neat sketches?
3. Explain about different types of sheet pile walls with schematic sketches?
4. Write briefly about static and seismic analysis Reinforced soil walls?
5. Explain various components of braced cuts with neat sketches?

## PART-B

**Answer any five of the following questions**                    **5 x 8 Marks= 40 Marks**

1. Derive Rankine's earth pressure theory? Limitations
2. An underground retaining wall has to be constructed for a railway passage at 20m below the ground level. Find the active pressure distribution for the side wall (whose height is 7m) of underground structure. The details of the soil layers are given in Table 1.

| Layer No | Unit wt (kN/m$^3$) | Angle of internal friction (deg) | Thickness of layer (m) |
|----------|---------------------|----------------------------------|------------------------|
| I | 17.3 | 35.8 | 1 |
| II | 17.3 | 35.8 | 3.5 |
| III | 17.5 | 30 | 3.5 |
| IV | 17.5 | 30 | 4.5 |
| V | 17.3 | 35.8 | 4.5 |
| VI | 17.5 | 30 | 3 |
| VII | 17.5 | 30 | 7 |

3. Describe the stability checking of sheet pile wall using fixed and free earth support methods?
4. Describe the necessity of reinforced earth. Write different components of .reinforced earth, their functions. How do we assess strength characteristics of reinforced soil? Explain laboratory tests?

5. Describe the methods for the design of various components of braced cuts? What are the factors that affect the pressure distribution?

6. Describe the equivalent beam method for the analysis of an anchored sheet piles?

7. a) Write notes on following?

   i) Cantilever wall

   ii) Counter fort wall

   iii) Reinforced earth retaining wall

   iv) Back fill material properties

   b) Check the stability of cantilever wall shown below against sliding failure and overturning failure. Use Rankine's theory (figure-1)?
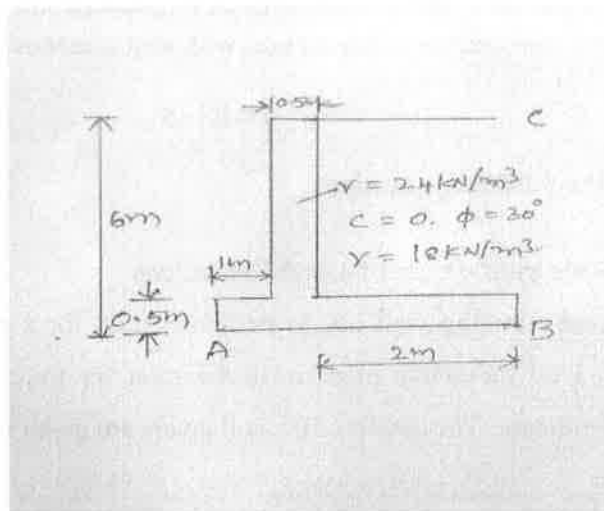


Figure-1

8. Discuss various methods for providing anchors for a sheet pile wall