R22

Code No: **R22D1503**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular Examinations, March 2023

Advanced Finite Element Analysis

(MD)

Roll No										

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

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A

(Write all answers of this part at one place)

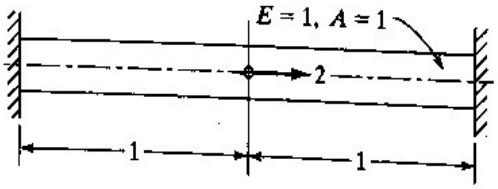
1	A	What is CST element	**[1M]**
	B	Define strain energy.	**[1M]**
	C	Draw the shape functions of quadratic element.	**[1M]**
	D	How the stress will change with effect of temperature.	**[1M]**
	E	What are the applications of 2 D elements.	**[1M]**
	F	Represent the node numbering of constant strain triangle element.	**[1M]**
	G	State the applications of fins.	**[1M]**
	H	Write the basic equation of heat transfer in FEM.	**[1M]**
	I	Write the expression for element mass matrix of a bar element.	**[1M]**
	J	Write the expression for element mass matrix of a truss element.	**[1M]**

SECTION-I

2	A	Discuss about Rayleigh- Ritz method	**[5M]**
	B	Discuss the applications of Finite Element Methods.	**[5M]**

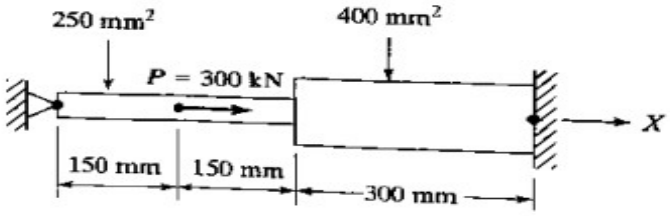
OR

3		Use the Galerkin method to find the mid point of the rod shown in Fig.2. E=1 N/M^2, A=1 m^2	**[10 M]**



SECTION-II

4		Consider the bar as shown in Fig.3. Determine the nodal displacements, stresses and support reactions. Solve this problem by hand calculation using the elimination method for handling the boundary conditions.	**[10 M]**

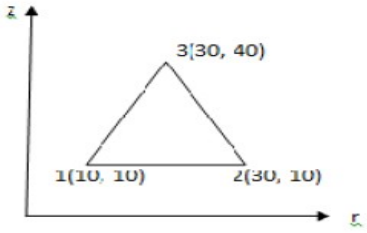


OR

5	A	Derive the stiffness matrix of a truss element.	**[5M]**
	B	Explain how temperature effects are taken into consideration for a truss element.	**[5M]**

SECTION-III

6	A	Discuss a few applications of axi-symmetric elements.	**[5M]**
	B	Nodal coordinates for an Axi-Symmetric element are given below. Evaluate Stiffness Matrix. $E=2x10^5 N/mm^2$, $\upsilon = 0.25$.	**[5M]**



OR

7	A	What are the properties of constant-strain triangular element? Explain.	**[5M]**
	B	Derive the shape functions of two dimensional four noded iso-parametric elements. Plot the shape functions.	**[5M]**

SECTION-IV

8		A circular fin of inner diameter 200 mm and outer diameter of 300 mm transfers heat from a small motorcycle engine. If the average engine surface temperature is 200^0 C, determine the temperature distribution along the fin surface. The thermal conductivity of the fin material is 20 W/m ^{0}C and the convective heat transfer coefficient between the fin and the atmosphere is 120W/m^2. ^{0}C. Assume an atmospheric temperature of 30^0C. Use at least three one Dimensional elements.	**[10 M]**

OR

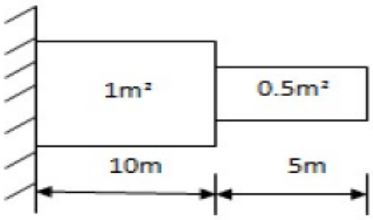
9		Determine the temperature distribution in 1D rectangular cross section fin with 8 cm long, 4 cm wide, 1 cm thick. Assume that convective heat loss occurs from the end of the fin. Take K= 3 W/cm.K, h = 0.1 W/cm^2. K and $T_\alpha = 20^0$C, tip temperature is 100^0C.	**[10 M]**

SECTION-V

10	A	Explain Consistent vs. lumped mass matrices	**[5M]**
	B	Explain free vibration analysis using FEM.	**[5M]**

OR

11	A	Determine the Eigen values and Eigen Vectors for the stepped bar as shown in figure?	**[10 M]**



$\rho = 7850\ Kg/m^3$

$E = 30 \times 10^6\ N/m^2$

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Code No: R22DHS53

R22

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular Examinations, March 2023

Research Methodology

(MD, TE,CSE, VLSIES &ASP)

Roll No										

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

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A

(Write all answers of this part at one place)

1	A	Write any four types of research.	**[1M]**
	B	List the qualities of good research?	**[1M]**
	C	In how many ways data can be classified?	**[1M]**
	D	Why is sampling used in research?	**[1M]**
	E	Give the classification of research design?	**[1M]**
	F	What is Hypothesis Testing?	**[1M]**
	G	Differentiate between z-test and t-test.	**[1M]**
	H	Give the name of one parametric test and one non parametric test.	**[1M]**
	I	What is bibliography?	**[1M]**
	J	What is a research report?	**[1M]**

PART-B

SECTION-I

2		Explain in detail the different steps involved in a research process.	**[10M]**
		OR	
3		What do you mean by research? Explain its significance in modern times.	**[10M]**

SECTION-II

4		Describe fully the techniques of defining a research problem.	**[10M]**
		OR	
5		How do you define a research problem? Give three examples to illustrate your answer.	**[10M]**

SECTION-III

6		Give your understanding of a good research design. Is single research design suitable in all research studies? If not, why?	**[10M]**
		OR	
7	A	Explain in detail the ethical issues in collecting data.	**[5M]**
	B	Explain the need and Characteristics of research design.	**[5M]**

SECTION-IV

8		How would you differentiate between simple random sampling and complex random sampling designs? Explain clearly giving examples.	**[10M]**
		OR	
9		Explain the procedure of central limit theorem and its applications.	**[10M]**

SECTION-V

10	A	Explain the meaning of analysis of variance. Describe briefly the technique of analysis of variance for one-way and two-way classifications.	**[5M]**
	B	State the basic assumptions of the analysis of variance.	**[5M]**
		OR	
11	A	Discuss in detail the basic principles and techniques of writing a Research Proposal.	**[5M]**
	B	Explain the steps in hypothesis testing for difference in mean.	**[5M]**

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R22

R22

Code No: R22D1506

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular Examinations, March 2023

Advanced Mechanics of Composite Materials

(MD)

Roll No										

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

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A

(Write all answers of this part at one place)

1	A	Give few examples of man made composites.	**[1M]**
	B	What are the structural applications of composites?	**[1M]**
	C	What are the properties of unidirectional lamina?	**[1M]**
	D	What is off-axis loading?	**[1M]**
	E	What type of materials generally follows Hooke's law?	**[1M]**
	F	Define Hooke's law?	**[1M]**
	G	What do you mean by orthotropic lamina?	**[1M]**
	H	What is a micro mechanic used for?	**[1M]**
	I	What is thin plate structure?	**[1M]**
	J	What are the stress components acting on a three dimensions thin plate?	**[1M]**

PART-B

SECTION-I

2	A	Explain the classification of composites based on matrix with suitable examples.	**[5M]**
	B	Explain the properties and applications of Polymer composites	**[5M]**
		OR	
3	A	Explain the properties and applications of Glass, Silica, Kevlar as reinforcements.	**[5M]**
	B	Explain the properties and applications of metal matrix composites	**[5M]**

SECTION-II

4	A	Explain the Autoclave method of composite manufacturing with the help of neat sketch.	**[5M]**
	B	Explain the tape production method of composite manufacturing with the help of neat sketch. I	**[5M]**

OR

5	A	Explain the moulding methods used in composite manufacturing with neat sketches?	**[5M]**
	B	Explain the filament winding method used in composite manufacturing with neat sketches?	**[5M]**

SECTION-III

6	A	What is stiffness modulus of elasticity? How do you calculate stiffness modulus?	**[5M]**
	B	Explain the concept of Hooke's law for two-dimensional unidirectional lamina.	**[5M]**

OR

7	A	List out the elastic constants of lamina and mention their symbols.	**[5M]**
	B	What is the relationship between stiffness and compliance?	**[5M]**

SECTION-IV

8		Explain the maximum stress and strain criteria for laminates.	**[10M]**

OR

9	A	Explain the failure envelope concept pertaining to laminates.	**[5M]**
	B	How do you characterize the free-edge effect? Explain.	**[5M]**

SECTION-V

10	A	Sate the basic assumptions made in thin plate theory.	**[5M]**
	B	What are 3 shortcomings of plate theory?	**[5M]**

OR

11		Explain the analysis of crosses and angle ply laminated plates	**[10M]**

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R22

Code No: **R22D1501**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular Examinations, March 2023

Advanced Mechanical Engineering Design

(MD)

Roll No										

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

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A

(Write all answers of this part a one place)

1	A	Define Creativity.	**[1M]**
	B	Write the need of stress concentration.	**[1M]**
	C	State any two DFM rules.	**[1M]**
	D	Write about concept generation.	**[1M]**
	E	Define Creep.	**[1M]**
	F	What are residual stresses?	**[1M]**
	G	Write about mating surfaces?	**[1M]**
	H	Mention the use of dynamic contact stresses.	**[1M]**
	I	Mention the significance of Break-even analysis.	**[1M]**
	J	Define Ergonomics.	**[1M]**

PARTB

SECTION-I

2	A	Sketch the heart of a design process, and explain its components	**[5M]**
	B	Distinguish between the Asirnov model and Shigley model.	**[5M]**
		OR	
3	A	Explain "Stress Concentration" with special reference to designing of machine elements.	**[5M]**
	B	How do you propose to reduce the effect of stress concentration?	**[5M]**

SECTION-II

4	A	Discuss the different approaches for concept testing of a new product.	**[5M]**
	B	List out the different product strategies to be followed in product design.	**[5M]**
		OR	
5	A	Discuss the product design for sand castings from the point of view of designing for minimizing the shrinkage defects.	**[5M]**
	B	Explain the design guidelines for non metallic parts.	**[5M]**

SECTION-III

6		A solid circular shaft made of steel Fe 620 (S_{ut} = 620 N/mm^2 and S_{yt} = 380 N/mm^2) is subjected to an alternating torsional moment which	**[10M]**

varies from -200 N-m to +400 N-m. The shaft is ground, and the expected reliability is 90%. Neglecting stress concentration, calculate the shaft diameter for infinite life, using the distortion energy theory of failure. The factor of safety may be taken as 2.0

OR

7	A	Differentiate between the harmful and beneficial residual stresses.	**[5M]**
	B	What are the different fatigue failure models? Explain with suitable examples.	**[5M]**

SECTION-IV

8	A	Distinguish between the design procedures for surface failure due to adhesive wear and abrasive wear.	**[5M]**
	B	Discuss the effect of dynamic contact stresses in surface failures.	**[5M]**

OR

9		The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following elements: i) ± 350 N/mm^2 for 85% of time, ii) ± 400 N/mm^2 for 12% of time, and iii) ± 500 N/mm^2 for 3% of time. The material of the component is 50C4 (S_{ut} = 660 N/mm^2), and the corrected endurance strength of the component is *280* N/mm^2. Determine the life of the component.	**[10M]**

SECTION-V

10	A	Write a short note on Break-even analysis.	**[5M]**
	B	Mention the significance of modern approaches in design.	**[5M]**

OR

11	A	What is the importance of material and process selection in value engineering? Explain.	**[5M]**
	B	List and explain the various ergonomical considerations in engineering design.	**[5M]**

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R22

Code No: R22D1502

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular Examinations, March 2023

Mechanical Behaviour of Materials

(MD)

Roll No										

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

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A

(Write all answers of this Part at one place)

1	A	What is Work hardening?	**[1M]**
	B	What is meant by super plasticity?	**[1M]**
	C	Define stress intensity factor.	**[1M]**
	D	Define Endurance Limit.	**[1M]**
	E	What are the factors motivating in selection of materials?	**[1M]**
	F	Suggest any two materials suitable for journal bearings. Justify your selection.	**[1M]**
	G	What is meant by smart materials?	**[1M]**
	H	Define shape memory alloy?	**[1M]**
	I	What are the applications of the polymers?	**[1M]**
	J	Name different types of structural ceramics.	**[1M]**

SECTION-I

2	A	Discuss about dispersion strengthening.	**[5M]**
	B	Discuss Larson Miller parameters with neat sketches.	**[5M]**

OR

3	A	Explain the effect of strain rate on the plastic behavior of engineering materials with a suitable diagram.	**[5M]**
	B	Explain ductile to brittle transition in steel.	**[5M]**

SECTION-II

4	A	Discuss mechanism of crack initiation and propagation of a fatigue crack.	**[5M]**
	B	Discuss the effect of surface an metallurgical parameters on fatigue.	**[5M]**

OR

5	A	Discuss safe life and fail safe design approaches.	**[5M]**
	B	Explain the procedure of failure analysis with an example.	**[5M]**

SECTION-III

6	A	What are the factors that influence the material selection for creep deformation?	**[5M]**
	B	Suggest the suitable material with appropriate justification for the application of Cylinder block of a passenger car.	**[5M]**

OR

7	A	Discuss the relationship between material selection and processing.	**[5M]**
	B	Enlist the characteristics of the material for corrosion resistance.	**[5M]**

SECTION-IV

8	A	What are the characteristics and applications of HSLA steels?	**[5M]**
	B	Write a short note on smart materials.	**[5M]**

OR

9	A	What are the characteristics and applications of types of steels?	**[5M]**
	B	Discuss about Nitrogen steels.	**[5M]**

SECTION-V

10	A	What are the production techniques of fibres?	**[5M]**
	B	What are the properties and application of Cubic Boron Nitride (CBN)?	**[5M]**

OR

11	A	What are the characteristics and applications of structural ceramics?	**[5M]**
	B	What are the properties and applications of Engineering polymers?	**[5M]**

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