R22

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL
(Autonomous Institution – UGC, Govt. of India)
M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024
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 (10 MARKS)
(Write all answers of this part at one place)

1	A	What is a Motivation in research?	**[1M]**
	B	What do you mean by Design of the research project.	**[1M]**
	C	What is a Pilot survey?	**[1M]**
	D	List the Components of a research problem.	**[1M]**
	E	What do you mean by Thematic Apperception Test	**[1M]**
	F	What are the ethical issue in collecting data?	**[1M]**
	G	Distinguish between Exclusive type and inclusive type class intervals	**[1M]**
	H	What do you mean by Sampling frame.	**[1M]**
	I	Distinguish between the Null hypothesis and alternative hypothesis	**[1M]**
	J	What is mean and varience?	**[1M]**

PART-B (50 MARKS)
SECTION-I

2	A	What do you mean by research? Explain its significance in modern times	**[5M]**
	B	Distinguish between Research methods and Research methodology.	**[5M]**

OR

3	A	Describe the different types of research, clearly pointing out the difference between an experiment and a survey	**[5M]**
	B	Briefly describe the different steps involved in a research process	**[5M]**

SECTION-II

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

OR

5	A	"Knowing what data are available often serves to narrow down the problem itself as well as the technique that might be used." Explain the underlying idea in this statement in the context of defining a research problem	**[5M]**
	B	Explain how to formulate the objectives of Research Work.	**[5M]**

SECTION-III

6   A   Describe some of the important research designs used in experimental hypothesis-testing research study.   **[5M]**

       B   "Research design in exploratory studies must be flexible but in descriptive studies, it must minimise bias and maximise reliability." Discuss   **[5M]**

<div align="center">OR</div>

7   A   Explain the meaning and significance of a Research design   **[5M]**

       B   Enumerate the different methods of collecting data. Which one is the most suitable for conducting enquiry regarding family welfare programme in India? Explain its merits and demerits.   **[5M]**

SECTION-IV

8   A   Write a brief note on different types of analysis of data pointing out the significance of each.   **[5M]**

       B   How will you differentiate between descriptive statistics and inferential statistics?   **[5M]**

<div align="center">OR</div>

9   A   What does a measure of central tendency indicate?   **[5M]**

       B   Explain the meaning and significance of the concept of "Standard Error' in sampling analysis.   **[5M]**

SECTION-V

10   A   The procedure of testing hypothesis requires a researcher to adopt several steps. Describe in brief all such steps.   **[5M]**

       B   Explain the meaning of analysis of variance. Briefly describe the technique of analysis of variance for one-way and two-way classifications.   **[5M]**

<div align="center">OR</div>

11   A   Write short notes on the following Precautions in applying Chi-square test   **[5M]**

       B   State the basic assumptions of the analysis of variance.   **[5M]**

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024

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 (10 MARKS)
(Write all answers of this part at one place)

1	A	What is meant by finite element method?	**[1M]**
	B	Give the conditions for a plane strain problem.	**[1M]**
	C	Write down shape functions of a bar element.	**[1M]**
	D	Write body force vector and traction force vector for 1-D bar	**[1M]**
	E	What is the difference between CST element and LST element?	**[1M]**
	F	Write the formula of two-point Gauss quadrature.	**[1M]**
	G	Write the applications of the fin.	**[1M]**
	H	Write the stiffness matrix of heat conduction element.	**[1M]**
	I	Enumerate the methods used for solving the Eigenvalue problem.	**[1M]**
	J	Difference between consistent and lumped mass matrices.	**[1M]**

PART-B (50 MARKS)
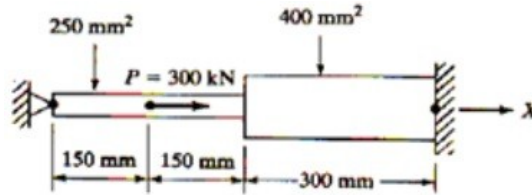### SECTION-I

2	A	Discuss the step by step procedure to solve any structural problem using finite element method.	**[5M]**
	B	Differentiate between plane stress and plane strain problems and write their stress-strain relations.	**[5M]**

OR

|			
3	A	If a displacement field is described by $$u = (-x^2 + 2y^2 + 6xy)10^{-4} \text{ and } v = (3x + 6y - y^2)10^{-4}$$ Determine the strains ε_x, ε_y and γ_{xy} at the point x = 3 and y = 2	**[5M]**
	B	Elucidate Galerkein's method by taking a suitable example.	**[5M]**

SECTION-II

4   Consider the bar loaded as shown in the Figure below. Determine the   **[10M]**
nodal displacements and element stresses. Solve this by adopting the
elimination method for handling boundary conditions.
Take E = 200 GPa.

OR

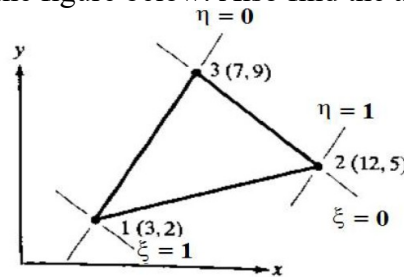**5**   For the two-bar truss as shown in the figure given below, Estimate (i)   **[10M]**
Nodal displacements and (ii) Stress in element indicating nodes 1 to 2.
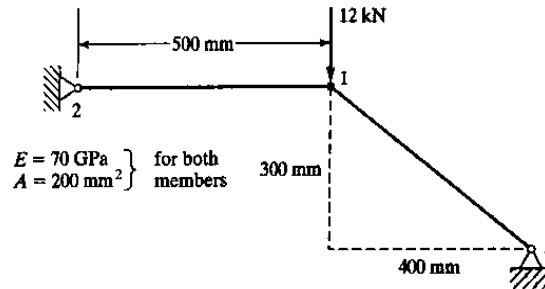
SECTION-III

6   Determine the Jacobian for the $(x,y) - (\xi, \eta)$ transformation for the   **[10M]**
element shown in the figure below. Also find the area of the triangle.


OR

7   Evaluate the following integral by two point and three-point Gauss   **[10M]**
quadrature and compare the result with the exact value.

$$I = \int_{-1}^{1} 5x^3 - 3x^2 - 5x - 3 \ dx$$

SECTION-IV

8   Determine the temperature distribution through the composite wall as   **[10M]**
shown in the figure when convective heat loss occurs on the left
surface. Assume unit area. Thicknesses $t_1 = 4$ cm, $t_2 = 2$ cm, $K_1 = 0.5$

W/cmK, $K_2 = 0.05$ W/cm K, $T_\alpha = -50°C$, h = 0.1 W/cm² K.
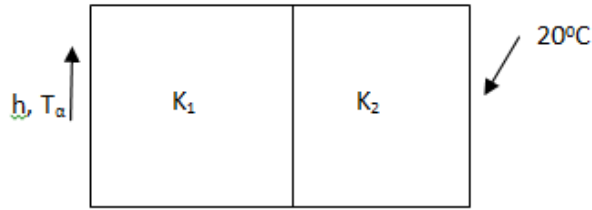
OR

9   A metallic fin, with the thermal conductivity k = 360 W/m⁰C, 0.1 cm   **[10M]**
thick and 10 cm long, extends from a plane wall whose temperature is
235⁰C. Determine the temperature distribution and amount of heat
transferred from the fin to the air at 20⁰C with h= 9 W/m² ⁰C. Take the
width of fin to be 1 m.
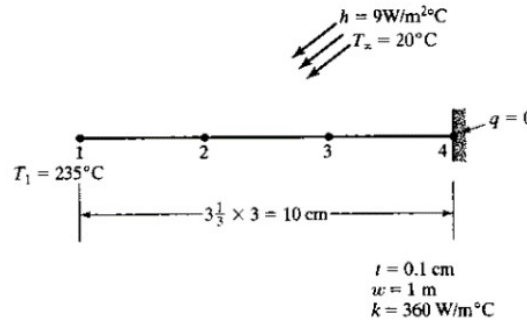
SECTION-V

10   A   Derive the mass matrix for the bar element from the first principles.   **[5M]**
    B   Write the properties of Eigenvectors. Discuss the characteristic   **[5M]**
      polynomial technique to solve the Eigen value problem.
                          OR

11   Determine the Eigen values and Eigen vectors of the bar as shown in   **[10M]**
the figure below. Take E = 200 GPa, $\rho = 7800$ kg/m³, A=0.258 m², and
L = 0.5 m.

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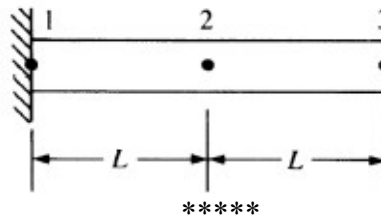
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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL **R22**

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024

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 (10 MARKS)

(Write all answers of this part at one place)

1	A	Define composite materials.	[1M]
	B	What are the properties of kevlar fibers?	[1M]
	C	What are the assumptions in mechanics of materials approach?	[1M]
	D	What is characterization of composites?	[1M]
	E	What is Hooke's law?	[1M]
	F	Why stress transformation is important?	[1M]
	G	What are the constants of orthotropic materials?	[1M]
	H	What is the failure envelope?	[1M]
	I	What is cross ply?	[1M]
	J	What is the difference between thin plate and thick plate.	[1M]

PART-B (50 MARKS)

SECTION-I

2	A	Differentiate between natural and man- made composites	[5M]
	B	List out the aerospace and structural applications of composites	[5M]

OR

3		Explain the properties and applications of the following fibers. i) Glass ii) Silica iii) Kevlar iv) carbon	[10M]

SECTION-II

4	A	Explain the laminate characteristics and configurations.	[5M]
	B	Explain the advantages and applications of pultrusion process.	[5M]

OR

5	A	Explain the filament winding method with the help of neat sketches.	[5M]
	B	Explain the advantages and applications of man layup method.	[5M]

SECTION-III

6	A	How many independent constants are there in general stiffness and compliance matrices for an anisotropic material?	[5M]
	B	Explain the relationship between stiffness and Young's modulus.	[5M]

OR

7		Explain how laminate analysis is done.	[10M]

SECTION-IV

8 Explain the concept of micro mechanics of failure? **[10M]**

OR

9 Explain the procedure to estimate the strength of an orthotropic lamina under tension and shear. **[10M]**

SECTION-V

10 Explain the thin plate theory in detail. **[10M]**

OR

11 A Explain the basic assumptions in thin plate theory. **[5M]**

B List out the 3 shortcomings of plate theory. **[5M]**

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Code No: R22D1501

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL $\boxed{\textbf{R22}}$

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024

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 (10 MARKS)
(Write all answers of this part at one place)

1	A	Define Stress concentration.	**[1M]**
	B	List the various design models.	**[1M]**
	C	What is product design?	**[1M]**
	D	What is concept generation?	**[1M]**
	E	List various failure theories.	**[1M]**
	F	Define maximum principal stress theory.	**[1M]**
	G	Define Wear.	**[1M]**
	H	Define fatigue strength.	**[1M]**
	I	What is Ergonomics?	**[1M]**
	J	Define Value Engineering.	**[1M]**

PART-B (50 MARKS)
SECTION-I

2	A	Explain the various phases of the design process with the help of a flow chart.	**[5M]**
	B	Explain all the phases of Asimov model.	**[5M]**

OR

3	A	Explain Shigley model for product design.	**[5M]**
	B	Explain the design considerations for Safety and Reliability.	**[5M]**

SECTION-II

4	A	Discuss the different approaches for concept testing of a new product.	**[5M]**
	B	Explain the important points to be considered while designing with plastics.	**[5M]**

OR

5	A	Discuss the design considerations for locating the parting line in drop forging dies. Give suitable example.	**[5M]**
	B	Explain the design considerations for casting.	**[5M]**

SECTION-III

6	A	Explain the Fracture Mechanics theory with suitable examples	**[5M]**
	B	The force acting on a bolt consists of two components – an axial pull of 15 kN, and a transverse shear force of 6 kN. The bolt is made of steel FeE 310 ($Syt = 310$ N/mm^2), and the factor of safety is 2.5. Determine	**[5M]**

the diameter of the bolt using the maximum shear stress theory of failure.

<div align="center">OR</div>

7	A	What are the different fatigue failure models? Explain with suitable examples	**[5M]**
	B	Explain Distortion energy theory.	**[5M]**

<div align="center"><u>**SECTION-IV**</u></div>

8	A	Explain dynamic contact stresses.	**[5M]**
	B	Distinguish between adhesive wear and abrasive wear.	**[5M]**

<div align="center">OR</div>

9	A	What is Surface Fatigue Strength, and how is it determined? Explain.	**[5M]**
	B	Discuss the effect of different contacts in surface failures.	**[5M]**

<div align="center"><u>**SECTION-V**</u></div>

10	A	Discuss about Break-even analysis.	**[5M]**
	B	Discuss Design of control	**[5M]**

<div align="center">OR</div>

11	A	Write a note on the process selection in value engineering.	**[5M]**
	B	Define the term 'Ergonomics' and bring out its importance in the design.	**[5M]**

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLO

(Autonomous Institution – UGC, Govt. of India)
M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024
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.
***
PART-A (10 MARKS)
(Write all answers of this part at one place)

1	A	Define True strain and engineering strain.	**[1M]**
	B	What is Larsen-Miller parameter?	**[1M]**
	C	Classify the stages of fatigue.	**[1M]**
	D	Differentiate between fatigue and creep failures.	**[1M]**
	E	State the factors in motivating in selection of materials.	**[1M]**
	F	Mention the desirable properties of materials used in nuclear power plants.	**[1M]**
	G	Name any two materials which exhibit shape memory effect.	**[1M]**
	H	Write about Nitrogen steel.	**[1M]**
	I	Define degree of polymerization.	**[1M]**
	J	write the purpose of coating the material.	**[1M]**

PART-B (50 MARKS)
SECTION-I

2	Explain strengthening mechanism due to dislocations with neat sketches.	**[10M]**

OR

3	Derive an expression for the stress required to propagate a crack in a brittle material using Griffith's theory of brittle fracture.	**[10M]**

SECTION-II

4	Enumerate the procedure of failure analysis with an example.	**[10M]**

OR

5	Discuss the mechanisms of crack initiation and propagation of fatigue crack.	**[10M]**

SECTION-III

6	What factors would you consider in selecting materials for nuclear applications? Suggest materials for this application.	**[10M]**

OR

7	List the factors that influence the material selection for creep deformation? Enlist the characteristics of materials for high temperature applications.	**[10M]**

SECTION-IV

8	Elaborate the characteristics and applications of HSLA and TRIP steels in detail.	**[10M]**
	OR	
9	What are intermetallics? Discuss on the types, properties and application of smart materials and shape memory alloys.	**[10M]**

SECTION-V

10	Extend the properties and applications of WC, TiC, TaC	**[10M]**
	OR	
11	What are ceramics? List and briefly explain the five important properties of ceramics that make them useful engineering materials.	**[10M]**

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