

Code No: R22DHS53

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Supplementary Examinations, August 2024

Research Methodology

(TE, CSE & 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.

PART-A (10 MARKS)

(Write all answers of this part at one place)

- 1 A What are the Objectives of research? [1M]
- B What is the Criteria of good research? [1M]
- C Define Experience survey. [1M]
- D Write about the Rephrasing the research problem [1M]
- E What do you mean by Holtzman Inkblot Test [1M]
- F Write about need for research design. [1M]
- G Distinguish between Statistics of attributes and statistics of variables [1M]
- H What is a Central limit theorem? [1M]
- I What is a hypothesis? [1M]
- J Define ANOVA. [1M]

PART-B (50 MARKS)

SECTION-I

- 2 A “Research is much concerned with proper fact finding, analysis and evaluation.” Do you agree with this statement? Give reasons in support of your answer. [5M]

- B What are the possible motives for doing research? [5M]

OR

- 3 A Describe the order concerning various steps provides a useful procedural guideline regarding the research process . [5M]

- B How does one go about developing working hypotheses? [5M]

SECTION-II

- 4 A What is the necessity of defining a research problem? Explain. [5M]

- B Write a comprehensive note on the “Task of defining a research problem” [5M]

OR

- 5 What is research problem? Define the main issues which should receive the attention of the researcher in formulating the research problem. Give suitable examples to elucidate your points [10M]

SECTION-III

- 6 A Clearly explain the difference between collection of data through questionnaires and schedules. [5M]

- B What is research design? Discuss the basis of stratification to be employed in sampling public opinion on inflation [5M]
- OR
- 7 A . Explain the meaning of the following in context of Research design(a) Experimental and Control groups;(b) Informal experimental designs [5M]
- B Give your understanding of a good research design. Is single research design suitable in all research studies? If not, why? [5M]
- SECTION-IV**
- 8 A Describe the important statistical measures often used to summarise the survey/research data [5M]
- B “Processing of data implies editing, coding, classification and tabulation”. Describe in brief these four operations pointing out the significance of each in context of research study [5M]
- OR
- 9 A Write a brief essay on statistical estimation. [5M]
- B Discriminate use of average is very essential for sound statistical analysis”. Why? Answer giving examples [5M]
- SECTION-V**
- 10 A Briefly describe the important parametric tests used in context of testing hypotheses. How such tests differ from non-parametric tests? Explain [5M]
- B Discuss about the basic principles of ANOVA. [5M]
- OR
- 11 A What is Chi-square test? Explain its significance in statistical analysis [5M]
- B Describe the Basic principles and techniques of writing a Research Proposal. [5M]

Code No: R22D1503

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Supplementary Examinations, August 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.

PART-A (10 MARKS)

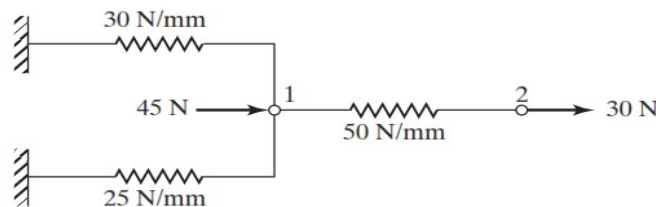
(Write all answers of this part at one place)

- 1 A Write the applications of FEM. [1M]
- B List the conditions for a plane stress problems. [1M]
- C What is the element stiffness matrix of a truss element [1M]
- D Draw the shape functions of bar element [1M]
- E Write Jacobian matrix for CST element. [1M]
- F Write a stiffness matrix for a quadrilateral element. [1M]
- G Write the element stiffness matrix of heat conduction element [1M]
- H Enumerate the modes of heat transfer. [1M]
- I Define the element mass matrix and write its formula. [1M]
- J Write any two properties of Eigen vectors. [1M]

PART-B (50 MARKS)

SECTION-I

- 2 Determine the nodal displacements of nodes 1 and 2 of the spring system loaded as shown in the figure below. [10M]



OR

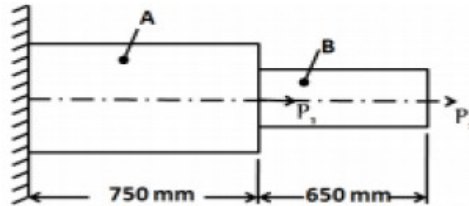
- 3 A Derive shape functions for 1-D bar element and draw the shape functions. [5M]
- B Derive the element stiffness matrix (K^e) of a bar element from the strain energy of the element. [5M]

SECTION-II

- 4 Determine the nodal displacement and the element stresses for the stepped bar loaded as shown in the Figure given below. $P_1=100$ kN and [10M]

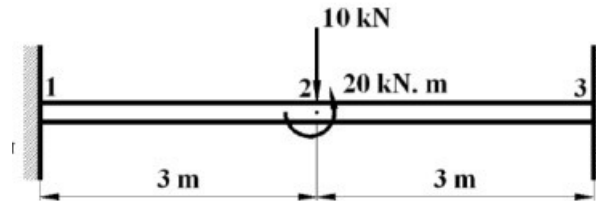
$P_2 = 75 \text{ kN}$. The details of each section of the bar are shown in the table:

Portion	Material	E(GPa)	Area(mm ²)
A	Steel	200	1200
B	Aluminium	70	800



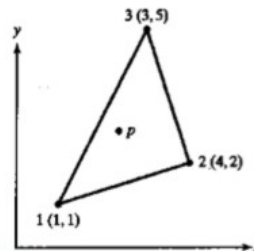
OR

- 5 For the beam shown in Figure below, estimate the displacements and the slopes at all the nodes. Take $E = 210 \text{ GPa}$ and $I = 4 \times 10^4 \text{ m}^4$. [10M]



SECTION-III

- 6 Estimate the following at the point P (2.5, 2.5) located inside the triangle as shown in below figure. i) The shape functions; and ii) Jacobian matrix (J) and iii) Strain-displacement matrix (B) for this element. [10M]



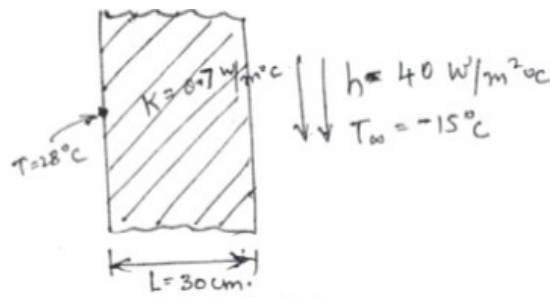
OR

- 7 Evaluate the following Integral (I) using one point and two-point gauss quadrature and compare the result with exact solution. [10M]

$$I = \int_1^1 \left[3e^x + x^2 + \frac{1}{x+2} \right] dx$$

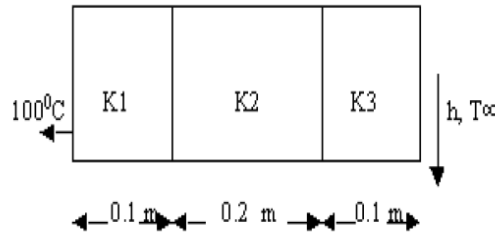
SECTION-IV

- 8 A brick wall of thickness $L = 30 \text{ cm}$, $K = 0.7 \text{ W/m}^\circ\text{C}$, has a temperature of 28°C at the inner surface, and the outer surface is exposed to cold air at -15°C as shown in Figure. Determine the steady state temperature distribution within the wall. Use the two-element model to assume one-dimensional heat flow. [10M]



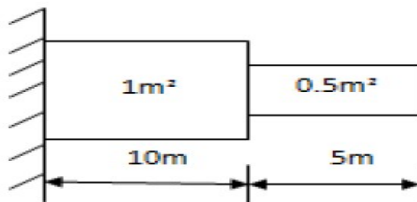
OR

- 9 Estimate the temperature distribution in the composite wall as shown in the figure given below. Take $K_1 = 25 \text{ W/m K}$; $K_2 = 10 \text{ W/m K}$; $K_3 = 5 \text{ W/m K}$; $h = 55 \text{ W/m}^2 \text{ K}$; and $T_\infty = 20^\circ\text{C}$. [10M]



SECTION-V

- 10 Determine the Eigenvalues & Frequencies and Eigen vectors & mode shapes for the stepped bar shown in the figure given below. Take values of $E = 200 \text{ GPa}$, $\rho = 7800 \text{ kg/m}^3$. [10M]



OR

- 11 Explain the following (i) Consistent mass matrix (ii) Lumped mass matrix and write the expression for mass matrices of bar, truss and beam elements. [10M]

Code No: R22D1506

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Supplementary Examinations, August 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.

PART-A (10 MARKS)

(Write all answers of this part at one place)

- 1 A What are the characteristics of composite materials. [1M]
- B What are the properties of glass fibers? [1M]
- C What are the properties of mechanics of materials approach? [1M]
- D What are the characteristics of laminated structures? [1M]
- E What is unidirectional lamina? [1M]
- F What is transformation of stress and strain? [1M]
- G What is the meaning of micro mechanics? [1M]
- H What is an orthotropic lamina? [1M]
- I What is a thin plate? [1M]
- J What is meant by orthotropic material? [1M]

PART-B (50 MARKS)

SECTION-I

- 2 Classify composites based on reinforcement and matrix with suitable examples [10M]

OR

- 3 Explain the properties and applications of metal matrix and ceramic matrix composites. [10M]

SECTION-II

- 4 A What are the applications of unidirectional composites? [5M]
- B Explain the function of each constituent material in a composite. [5M]

OR

- 5 A Explain the Autoclave method of composite manufacture with the help of neat sketches. [5M]
- B What are the advantages and disadvantages of tape production method [5M]

SECTION-III

- 6 A Explain the Graphic interpretation of stress-strain relations Off-axis. [5M]
- B Explain the concept of stiffness modulus with a suitable example. [5M]

OR

- 7 A Explain the relationship between compliance and stiffness matrix? [5M]
- B Explain in brief the constitutive relations of stress and strain. [5M]

SECTION-IV

- 8** Explain various failure mechanisms in Unidirectional Lamina. **[10M]**
OR
- 9** A Explain the first ply failure method? **[5M]**
B Explain various free-edge effects in composite laminates. **[5M]**

SECTION-V

- 10** Explain the orthotropic plate theory in detail. **[10M]**
OR
- 11** Explain the cross-ply and angle-ply laminate theory in detail. **[10M]**

Code No: R22D1501

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Supplementary Examinations, August 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.

PART-A (10 MARKS)

(Write all answers of this part at one place)

- 1 A Define the term Reliability. [1M]
- B List four mechanical properties of a material. [1M]
- C What is concept selection? [1M]
- D What is concept testing? [1M]
- E Define Maximum shear stress theory. [1M]
- F Define Creep. [1M]
- G What is Corrosion wear? [1M]
- H What is an adhesive wear? [1M]
- I What are the modern approaches in design? [1M]
- J What is Break-even analysis? [1M]

PART-B (50 MARKS)

SECTION-I

- 2 A Write about Creativity and Creative techniques in design philosophy. [5M]
 - B Explain the need analysis of the product design [5M]
- OR

- 3 A Discuss the factors to be considered in the selection of materials. [5M]
- B Explain Norton model for product design. [5M]

SECTION-II

- 4 A Explain the important points to be considered while designing with Rubber. [5M]
 - B Explain the two stages of concept selection. [5M]
- OR

- 5 A Discuss the steps involved in casting design. [5M]
- B Explain the design Procedure adopted for non-metallic parts. [5M]

SECTION-III

- 6 A Explain the Modified Mohr's theory of static failure with example. [5M]
- B The stress components in a part of a structure have been calculated to $\sigma_{xx} = 120$ MPa, $\sigma_{yy} = 80$ MPa, $\sigma_{xy} = 60$ MPa, and $\tau_{xy} = 60$ MPa (all other stress components are zero). Using the maximum normal stress criteria, investigate material failure. The material is brittle and it has the ultimate

strength $\sigma_{ut} = 150$ MPa, in tension and the ultimate strength $\sigma_{uc} = 200$ MPa, in compression.

OR

- 7 A Explain fatigue failure modes. [5M]
B Describe the stress Life approach and strain life approach of fatigue failure mode [5M]

SECTION-IV

- 8 A Briefly Discuss about surface fatigue strength. [5M]
B Briefly discuss about Surface geometry and mating surfaces. [5M]

OR

- 9 A Distinguish between abrasive wear and corrosive wear. [5M]
B Discuss different wear mechanisms with neat sketches. [5M]

SECTION-V

- 10 A Discuss Ergonomical considerations in engineering design. [5M]
B What is value engineering? Explain. [5M]

OR

- 11 A Explain the design of controls. [5M]
B What are Human considerations in engineering design? Why are they necessary? [5M]
