

Research Methodology
(TE, VLSI&ES & ASP)

Roll No									
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Time: 3 hours**Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 Define research, motives for business research, and distinguish between fundamental research and applied research and examine the series of interrelated steps in management research process. [14M]

OR

- 2 What do you understand by research methodology, state the types of research, and apprehend the steps that need to be accomplished in order to complete the management research study? [14M]

SECTION-II

- 3 How do you formulate a research problem? What considerations should a researcher keep in mind while formulating a research question and discuss the importance of literature review in approaching a research problem? [14M]

OR

- 4 Discuss the purpose of hypothesis in marketing research, highlight the procedure of developing a good hypothesis and how is a null hypothesis tested? [14M]

SECTION-III

- 5 What is the purpose of research design? Explain the elements, principals of experimental research design? and brief on types of research design suitable of researching the online education system in India. [14M]

OR

- 6 Discuss different methods of collecting data, its merits and demerits and brief on the ethical issues in collecting data. [14M]

SECTION-IV

- 7 What is the significance of sample selection, explain the factors should be considered while sample selection and brief on various sampling methods? [14M]

OR

- 8 Discuss the role of measures of central tendency in data analysis and what test is used to examine the statistical significance of correlation coefficient? [14M]

SECTION-V

- 9 Examine the role of analysis of variance in research? Discuss the procedure involved in analysis of variance; tabulate the ANOVA table in both the one-way and the two-way classification. [14M]

OR

- 10 Examine the basic principles and techniques of writing the research proposal and brief on the various stages, criteria for good research report. [14M]

Code No: R20D1502

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)

R20

M.Tech I Year I Semester Supplementary Examinations, December 2021
Mechanical Behaviour of Materials

(MD)

Roll No										
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 a) Explain the Griffith's theory of brittle fracture with relevant diagram. [7M]
b) Give a brief account on high temperature fracture. [7M]
OR
- 2 a) Define work hardening. Explain about the Grain boundary strengthening. [7M]
b) Explain the deformation of non-crystalline material. [7M]

SECTION-II

- 3 What is failure analysis? Explain the step-by-step procedure of failure analysis. [14M]
OR
- 4 (a) What is the effect of stress concentration on fatigue? Explain. [7M]
(b) What is Paris law? Explain the crack initiation and propagation mechanism. [7M]

SECTION-III

- 5 Briefly explain the method of selection of materials on basis of
a) Cost [7M]
b) Service requirement [7M]
OR
- 6 With a case study explain the selection of materials for aero applications. [14M]

SECTION-IV

- 7 What is metallic glass? Explain their important characteristics and applications. [14M]
OR
- 8 Write a short note on
a) Dual Phase steels [7M]
b) Nitrogen steel [7M]

SECTION-V

- 9 Explain the properties, processing techniques of WC, TiC and SiC materials with their applications. [14M]
OR
- 10 Discuss about the production techniques of fibers, foams and adhesives with neat sketch. [14M]

Code No: R20D1501

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R20

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Supplementary Examinations, December 2021

Advanced Mechanical Engineering Design

(MD)

Roll No										
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 a) Explain the various phases of the design process with the help of a Flow chart. [7M]
b) Explain “Stress Concentration” with special reference to designing of machine elements. How do you propose to reduce the effect of stress concentration? [7M]

OR

- 2 a) What is engineering design and their types [5M]
b) Explain various types of loads from design point of view and how factor of safety determined. [5M]
c) Describe reliability consideration in design. [4M]

SECTION-II

- 3 a) What are the important points to be considered while designing with plastics? Explain. [7M]
b) Discuss the different approaches for concept testing of a new product. [7M]

OR

- 4 a) Explain design considerations for casting [7M]
b) Explain major recommendations for selection of materials in Machine Design. [7M]

SECTION-III

- 5 a) Explain about Maximum Principal Stress theory. [7M]
b) Distinguish between Static failure and Fatigue failure [7M]

OR

- 6 a) What are the different fatigue failure models? Explain with suitable examples. [6M]
b) The force acting on a bolt consists of two components – an axial pull of 12 kN, and a transverse shear force of 6 kN. The bolt is made of steel FeE 310 ($S_{yt} = 310 \text{ N/mm}^2$), and the factor of safety is 2.5. Determine the diameter of the bolt using the maximum shear stress theory of failure. [8M]

SECTION-IV

- 7 a) What is Surface Fatigue Strength, and how is it determined? Explain. [7M]
b) Distinguish between adhesive wear, abrasive wear, and corrosion wear by giving suitable examples. [7M]

OR

- 8 a) Briefly explain different surface fatigue failure modes [7M]
b) Briefly explain different measures to be taken to avoid surface failure [7M]

SECTION-V

- 9 Explain about various modern approaches in design [14M]

OR

- 10** a) Write economical considerations in engineering design.
b) Explain the selection process of material in value engineering

[7M]

[7M]

Code No: R20D1506

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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R20

M.Tech I Year I Semester Supplementary Examinations, December 2021

Advanced Mechanics of Composite Materials

(MD)

Roll No										
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 a) How do you classify the composites? Discuss. [7M]
b) Explain the steps involved in the production of carbon fibre from pitch. [7M]

OR

- 2 a) Explain the production process of glass fibre. [7M]
b) Explain the following: [7M]
i) Homogeneity
ii) Isotropy
iii) Transversely Isotropic material.

SECTION-II

- 3 a) Derive the relationship between density of the composite and weight fractions of its constituents. [7M]
b) What are the advantages and disadvantages of pultrusion? [7M]

OR

- 4 a) A burn-off test was performed to determine the volume fractions of constituents in a glass-fiber-reinforced epoxy composite. The following observations were made: [7M]
Weight of empty crucible = 47.6504 g
Weight of crucible and a small piece of composite = 50.1817 g
Weight of crucible and glass after the burn-off = 49.4476 g
Calculate the weight and volume fractions of glass fibers and epoxy resin. Assume that the densities of the fibers and resin are 2.5 and 1.2g/cm³, respectively.

- b) Explain the manufacturing process of composites using autoclave processing. [7M]

SECTION-III

- 5 a) Explain the stress-strain relationship for specially orthotropic lamina. [7M]
b) Determine the stiffness and compliance matrices for a unidirectional lamina that has the following engineering constants: [7M]
 $E_L=20$ GPa, $E_T=2$ GPa, $G_{LT}=0.7$ GPa, $\nu_{LT} = 0.35$

OR

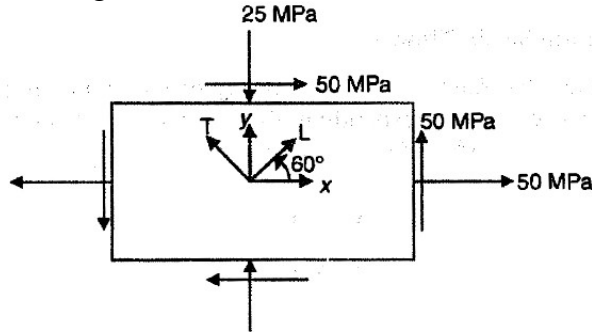
- 6 a) Establish the relations between Engineering constants and elements of stiffness and compliance matrices. [7M]

- b) Explain Hooke's law for Isotropic and transversely Isotropic materials [7M]

SECTION-IV

- 7 a) Explain the failure mechanism of a unidirectional composite subjected to a longitudinal load. Also find the expression for critical volume fraction. [7M]
 b) Explain, Strength of orthotropic lamina using the Maximum stress theory. [7M]
- OR

- 8 a) The following lamina has the elastic constants: [7M]



$$\sigma_{LU} = 1062 MPa \quad \sigma_{TU} = 31 MPa$$

$$\sigma'_{LU} = 610 MPa \quad \sigma'_{TU} = 118 MPa$$

$$\tau_{LU} = 72 MPa$$

$E_L=38.6 GPa; E_T=8.27 GPa; \nu_{LT}=0.26; G_{LT}=4.14 GPa$

Determine if, according to the maximum-strain theory, the lamina will fail. Assume that the lamina deforms linearly up to failure.

- b) Explain, Strength of orthotropic lamina using the Maximum strain theory. [7M]

SECTION-V

- 9 a) Derive the strain-displacement relations in terms of the mid plane strains and the plate curvatures. [7M]
 b) Consider a two-ply laminate with the ply orientations of 0° and 90° with the laminate axes. The bottom lamina is a 0° layer with a thickness of 5 mm, whereas the 90° top lamina is 3 mm thick. Evaluate A matrix for the laminate if both the laminae have identical stiffness matrix Q as follows: [7M]

$$[Q] = \begin{bmatrix} 20 & 0.7 & 0 \\ 0.7 & 2.0 & 0 \\ 0 & 0 & 0.7 \end{bmatrix} GPa$$

OR

- 10 a) Explain the following [8M]
 i) Cross ply laminate
 ii) Angle ply laminate
 b) What are the assumptions made in formulating thin plate theory? [6M]

Code No: R20D1503

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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R20

M.Tech I Year I Semester Supplementary Examinations, December 2021

Advanced Finite Element Analysis

(MD)

Roll No									
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 a) State and explain the variational approach. [7M]
b) State and explain the Rayleigh – Ritz method. [7M]

OR

- 2 a) What are the basic steps involved in FEA and explain them briefly. [7M]
b) Write the advantages, disadvantages, and applications of FEM. [7M]

SECTION-II

- 3 Calculate nodal displacement and elemental stresses for the truss shown in fig.1. [14M]
Take $E=70$ GPa and cross-sectional area $A=2$ cm² for all truss members.

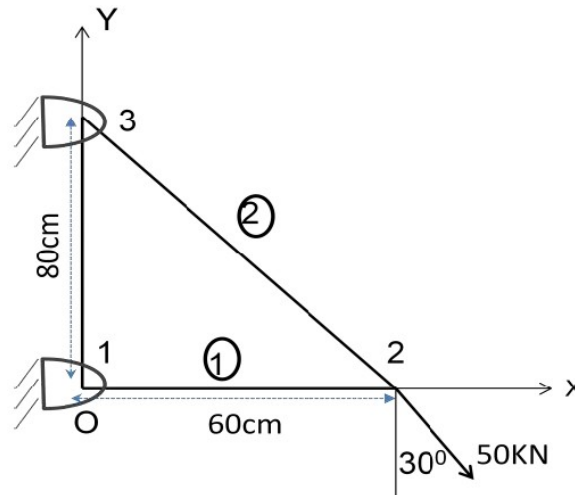


Fig.1

OR

- 4 Consider a bar as shown in fig.2. Young's Modulus $E = 2 \times 10^5$ N/mm². [14M]
 $A_1 = 2$ cm², $A_2 = 1$ cm² and force of 100 N is applied. Determine the nodal displacements, elemental stresses and reaction forces.

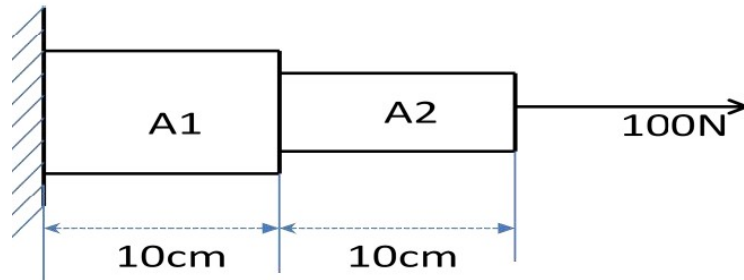


Fig.2

SECTION-III

5 Derive the strain displacement matrix of two dimensional four noded isoparametric elements. [14M]

OR

6 Evaluate jacobian matrix at $\xi = \eta = 0.5$ for the linear quadrilateral element shown in fig.3. [14M]

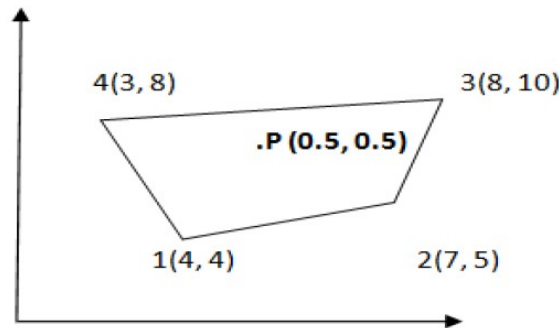


Fig. 3

SECTION-IV

7 For the composite wall shown in fig. 4, determine the interface temperatures considering three elements. [14M]

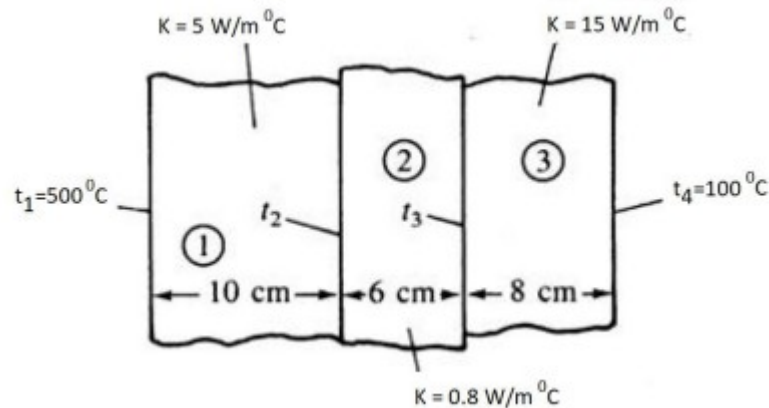


Fig. 4

OR

8 Estimate the temperature profile in a pin fin of diameter 25 mm, whose length is 500 mm. The thermal conductivity of the fin material is 50 W/m K and heat transfer coefficient over the surface of the fin is 40 W/m² K at 30°C. The tip is insulated and the base is exposed to a temperature of 150°C. Evaluate the temperatures at points separated by 100 mm each. [14M]

SECTION-V

- 9 a) Find the natural frequency of vibration of a fixed-free bar in axial motion [8M]
based on a one-element model using consistent mass matrix.
b) Discuss Eigen value and Eigen vector analysis. [6M]
- OR
- 10 Determine the Eigen values and Eigen vectors of the bar shown in fig. 5. Take [14M]
 $E=200$ GPa, $\rho = 7862$ kg/m³, $A=6$ cm² and $L=2.5$ m.

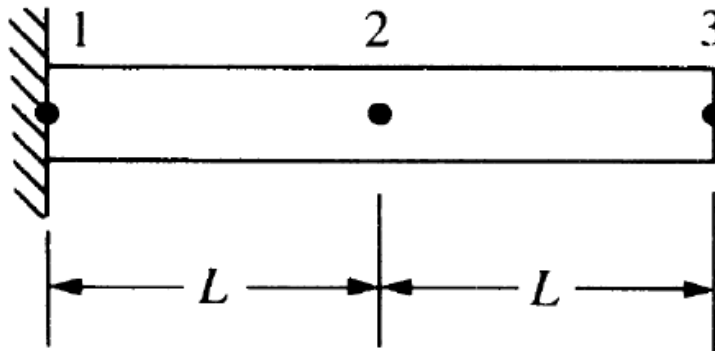


Fig. 5
