MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

III Year II Semester

QUESTION BANK

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF AERONAUTICAL ENGINEERING
MODEL QUESTION PAPER – I

Year: III YR II SEMESTER **SUB: Computational Aerodynamics**

SECTION - A

ANSWER ALL QUESTIONS:

1. What is CFD? Explain CFD as research and design tool.
2. What is characteristic line and explain its importance in finding behaviour of PDE's.
3. What is the significance of eigen values and how they classify the behaviour of PDE's.
4. Discuss pros and cons of higher order finite differences.
5. What is difference equation and write for Laplace equation.
6. Define Grid and its need for CFD.
7. Explain the nomenclature of 2D and 3D grid.
8. Explain about upwind scheme on Cartesian grid.
9. What is predictor step?
10. What are over-relaxation and under-relaxation factors?

SECTION - B

1. Derive the continuity equation for a control volume moving with fluid and transform it to other models with neat diagram.

(OR)

2. Derive the equation for Substantial derivative with neat sketch.
3. Explain the procedure to find the mathematical behaviour of partial differential equation using cramers rule method with an example of linearized velocity potential equation for subsonic and supersonic case and its effect on CFD?

(OR)

4. Give the classification of Partial Differential Equations, explaining the characteristics of each type of PDE.
5. Derive finite difference schemes for the following partial differential equations and indicate their order of accuracy:
   (i) $(\partial u/\partial t) + a\,(\partial u / \partial x) = 0$.
   (ii) $(\partial u/\partial t) = a\,(\partial^2 u / \partial x^2)$.
   (iii) $(\partial^2 u / \partial x^2) + (\partial^2 u / \partial y^2) = 0$.

(OR)

6. Using the Taylor's series approximation, derive the finite difference expressions for first order and second order differential terms of variable, Φ.
7. Discuss difference between structured and unstructured grid. Write short note on the following types of grids with neat sketches:
   a) Adaptive grids b) Stretched grids c) Overset grids

(OR)

8. Explain cell-centered and cell-vertex discretization methodologies with their constraints in selection. Discuss general formulation of a numerical scheme for 2D problem based on finite volume method.

9. Explain MacCormack's explicit finite difference technique and discuss its advantage over Lax-Wendroff method.

(OR)

10. Describe the philosophy of Pressure Correction technique. Explain how boundary conditions are specified consistent with the philosophy of Pressure Correction method.

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MODEL QUESTION PAPER – II

Year: III YR II SEMESTER **SUB: Computational Aerodynamics**

SECTION - A

ANSWER ALL QUESTIONS:

1. Explain applications of CFD in various engineering sciences.
2. Write a short on CFD approach to solve parabolic form of equations with example.
3. Write a short on CFD approach to solve hyperbolic form of equations with example.
4. Write a short note on supersonic flow over blunt body.
5. Write the various forms of finite differences for first and second derivatives?
6. What are the different types of boundary approximations can be done for curved boundaries to accommodate Cartesian grid.
7. What is the difference between FVM and FDM.
8. Why FVM is also known as Conservative Discretization.
9. What is checker board velocity distribution?
10. What is the need of staggered grid for pressure correction technique?

SECTION – B

1. Derive the energy equation for infinitesimal moving fluid element with neat sketch.

(OR)

2. (a) Discuss the relative merits and demerits of analytical, experimental and computational approaches in the analysis of fluid flows. Discuss the steps involved in CFD process.
   (b) Explain various methods of calculation of flows with shocks. Discuss their relative merits and demerits.
3. Explain the procedure to find the mathematical behaviour of partial differential equation using Eigen value method with an example of linearized velocity potential equation for subsonic and supersonic case and its effect on CFD?

(OR)

4. Discuss the mathematical and physical behavior of flows governed by parabolic equations with an example of boundary layer flows.
5. Derive the stability condition for CTCS discretization of second order wave equation using von Neumann stability analysis.

(OR)

6. Obtain the CFL condition for Lax method of discretization of first order wave equation.
7. Explain about importance of numerical aspects of dissipation and dispersion with artificial viscosity.

(OR)

8. Explain Crank-Nicolson implicit scheme used for solving the parabolic partial differential equations
9. Explain PISO algorithm for solving incompressible viscous flow problems.

(OR)

10. Derive Pressure Correction formula considering two dimensional flows and explain step by step procedure for SIMPLE algorithm.

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MODEL QUESTION PAPER – III

Year: III YR II SEMESTER **SUB: Computational Aerodynamics**

SECTION - A

ANSWER ALL QUESTIONS:

1. Write a brief note on different type of fluid models.
2. Differentiate conservative and nonconservative form of governing equations and its impact on CFD.
3. Write a short on CFD approach to solve elliptic form of equations with example.
4. What is meant by discretization and finite difference method?
5. What is CFL condition?
6. What are Stretched / Compressed Grid?
7. What are I, H, C-H, H – O – H Meshes.
8. What is artificial viscosity?
9. What are the advantages of two step CFD Techniques.
10. Why compressible flow code takes longer time to converge incompressible flow problems.

SECTION – B

1. What is the physical meaning of Divergence of velocity and derive the equation with neat sketch.

(OR)

2. Derive the x-momentum equation for an infinitesimal moving fluid element with neat diagram.
3. For one dimensional heat conduction equation:
   (a)Obtain discretized form of finite difference quotient.
   (b) Using explicit method, write algebraic equations for 4 X 4 grid.
   (c) Explain any numerical method to obtain solution for temperatures.

(OR)

4. How do you determine the accuracy of the discretization process? What are the uses and difficulties of approximating the derivatives with higher order finite difference schemes? How do you overcome these difficulties?

5. Discuss briefly about multiblock and non conformal grids with neat sketches with applications.

(OR)

6. Write the basic procedure of Finite Volume Discretization and difference between FDM and FVM?

7. Discuss ADI method for solving parabolic problems with an example and neat sketches.

(OR)

8. Describe how relaxation method is more superior in solving the elliptical partial differential with an example.

9. Describe the calculation of the flow field of incompressible viscous fluids Using SIMPLE algorithm writing down the important steps. Draw the staggered grid indicating the physical parameters used in this algorithm.

(OR)

10. Describe SIMPLER pressure correction technique for an incompressible viscous flow and compare it with SIMPLE technique.

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MODEL QUESTION PAPER – IV

Year: III YR II SEMESTER **SUB: Computational Aerodynamics**

SECTION - A

ANSWER ALL QUESTIONS:

1. Explain the physical meaning of substantial derivative and divergence of velocity.
2. What is the difference between differential and integral form of equations with its effect on CFD.
3. What are different types of errors and stability of solution?
4. Why first order wave equation is unconditionally unstable with FTCS scheme?
5. How did boundary nodes are calculated with higher order accuracy.
6. Write short note on triangular, tetrahedron, quadrilateral, hexahedron and hybrid cells.
7. Write procedure to solve 1D problem using FVM.
8. What is Cell-averaged method?
9. Write a short note on various types of flux evaluations across surfaces.
10. What is meant by CFD Technique?

SECTION – B

1. Explain the concepts of domain of dependence and range of influence as applicable to the solution of hyperbolic equations and elliptic equations with neat sketches and its impact on CFD.

(OR)

2. What is the need for classification of PDE and how do you classify second orderPDE?
3. Explain Von Neumann stability analysis for first and second order wave equations in detail with a neat sketch.

(OR)

4. Given the function $f(x) = x^3-5x$, calculate $\partial f/\partial x$, $\partial^2 f/\partial x^2$, at x=0.5 and 1.5 by using second order central, forward and backward differencing. Using step sizes 0.00001, 0.0001, 0.01, 0.2, 0.3 determine numerical error for each computation.

5. Explain C-H, H-O-H, O-H grid topologies with sketches along with their applications.

(OR)

6. Explain suitable grid for moving body problems and grid quality parameters with neat sketches.
7. Explain the two-dimensional finite volume method and describe evaluation of fluxes through cell surfaces using central discretization schemes

(OR)

8. Define finite volume discretization and explain the features which distinguish the interpretation of finite volume methods from the finite difference approach
9. Explain how the concepts of numerical dissipation and artificial viscosity are used to stabilize and smoothen numerical solutions.

(OR)

10. Explain the CFD Technique to solve the conservation form of viscous flow governing equations for unsteady problem.

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MODEL QUESTION PAPER – V

Year: III YR II SEMESTER **SUB: Computational Aerodynamics**

SECTION - A

ANSWER ALL QUESTIONS:

1. How CFD is helpful as a research tool, a design tool, and an educational tool in analyzing fluid dynamical problems
2. Discuss how Computational Fluid Dynamics is vital in the following fields Automobile engineering and Industrial manufacturing.
3. Discuss with a neat diagram shock capturing method along with its merits and demerits
4. Write down the most generic form of a partial differential equation used in CFD and explain the significance of each term
5. Explain different type of methods to classify the partial differential equations.
6. What is the difference between Implicit and Explicit methods?
7. When Cartesian grids are appropriate to use and what are its advantages.
8. Why Finite volume method is suitable for Fluid dynamic problems.
9. Explain the importance of single step and double step CFD techniques.
10. Write a short note on difference between SIMPLE and SIMPLEC algorithms.

SECTION – B

1. Write about difference between analytical, experimental and computational study of fluid dynamics. Explain the impact of CFD in present research fields with an example.

(OR)

2. Explain the importance of various forms of fluid models with neat sketches and when do we use respective models to derive governing equations of fluid flow. How do these models effect CFD methodology.
3. A two-dimensional small-disturbance velocity potential equation for compressible flows is given as $(1 - M_\infty^2)\frac{\partial^2 \emptyset}{\partial x^2} + \frac{\partial^2 \emptyset}{\partial y^2}$, where *M* is the Mach number of flow.
   (i) Examine whether this equation is parabolic, elliptic, or hyperbolic?
   (ii) Justify your inference from pure physical arguments.

(OR)

4. Identify the nature of the following systems of partial differential equations:

   $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$ and $\frac{\partial u}{\partial y} = v$where *u* and *v* are the two dependent variables.

5. What are the types of discretization techniques and their advantages over other? Explain the discretization of higher order derivatives and how to increase its accuracy.

(OR)

6. Explain the two-dimensional finite volume method and describe evaluation of fluxes through cell surfaces using central discretization schemes and how to evaluate areas of volumes with neat sketches.
7. (a) Compare all the three different types of Implicit, Explicit methods of solving unsteady state conduction problems and discuss the problems associated with these methods.
   (**b)** Why stability criteria need to be satisfied for the explicit method of solving the transient equation? Explain

(OR)

8. Describe a relaxation method for solving the elliptical partial differential
9. Describe SIMPLER pressure correction technique for an incompressible viscous flow and compare it with SIMPLE technique.

(OR)

10. Explain PISO algorithm for solving incompressible viscous flow problems and its advantages over SIMPLE and SIMPLEC algorithms

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
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MODEL QUESTION PAPER – I

Year: III YR II SEMESTER **SUB: FINITE ELEMENT METHODS**

PART A **(25 MARKS)**

1. a. What is meant by Engineering analysis and specify its Types (2M)
   b. What is Hermite shape function (3M)
   c. Write the equilibrium equations for 3D body (2M)
   d. What is coordinate system. specify the types and explain (3M)
   e. What is meant by axi-symmetric problems (2M)
   f. Derive the shape functions for 2D truss element (3M)
   g. What is the degree of freedom for the thermal problems (2M)
   h. Distinguish between CST and LST (3M)
   i. Write the dynamic equation of motion for the undamped free vibrations (2M)
   j. Determine the Area of the triangle A(2,2),B(7,4) ,C(3,6) (3M)

PART B **(10X5=50 MARKS)**

2. a) Derive the equations of equilibrium in case of a three dimensional stress system.

   b) Discuss the advantages and disadvantages of FEM over
   (i) Classical method
   (ii) Finite difference method.

OR

3.a) Solve the differential eqationfor the physical problem expressed as $d^2y/dx^2+100=0$when 0=x=10 with boundary
condition as y(0)=0 and y(10)=0 using i) point collocation ii) sub-domain collocation iii) least square method
iv) galarkin method

b) Write the Strain displacement equations for three dimensional system

4. a) Determine the nodal displacement, Element stresses for axially loaded bar as shown in the fig. below

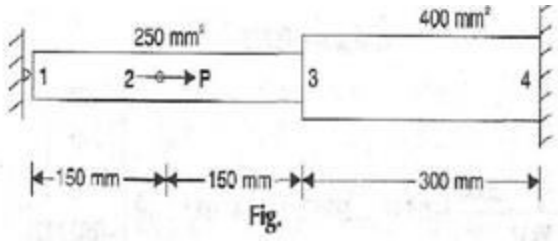


Fig.

b) Derive the strain displacement matrices for triangular element of revolving body.

OR

5 a) For the beam shown in Figure below, determine the following: a) Slopes at nodes 2 and 3

b) Vertical deflection at the mid-point of the distributed load. Consider all the elements have E=200GPa, I=5X10^6 mm^4

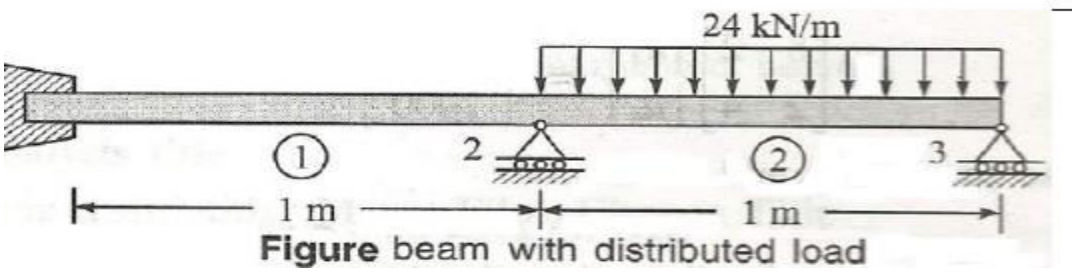
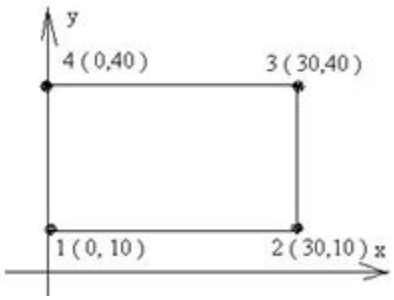


Figure beam with distributed load

6. a) For the element shown in the figure, assemble Jacobian matrix and strain displacement matrix

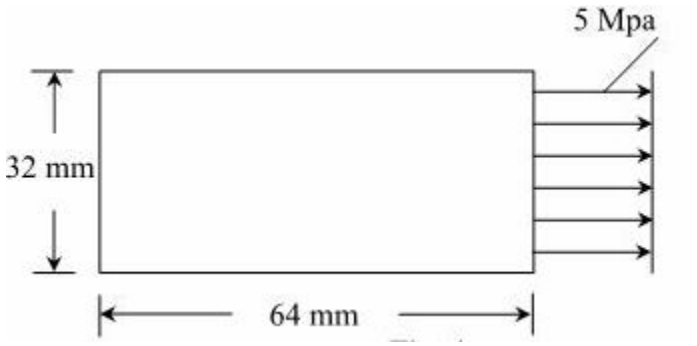


b) Determine the shape functions for a 8 node quadratic quadrilateral Evaluation element(boundary noded).

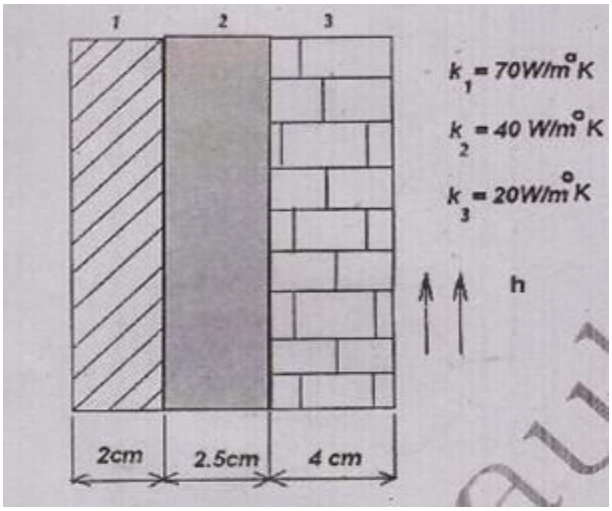
OR

7. a) Establish the shape functions for a 3 – noded triangular element

b) Find the deformed configuration, and the maximum stress and minimum stress locations for the rectangular plate loaded as shown in the fig. Solve the problem using 2 triangular elements. Assume thickness = 10cm; E = 70 Gpa, and υ = 0.33

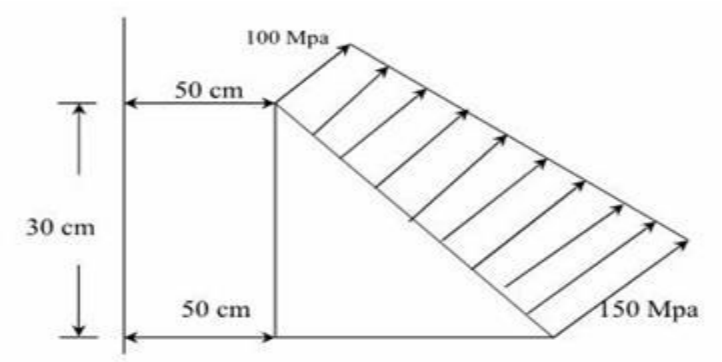


8, The composite wall consists of three materials shown in figure. The inside wall temperature is at 200^0C and the outside air temperature is 50^0C with a convection coefficient of 10 W/m^2 ^{0}C. Determine the temperature along the composite wall

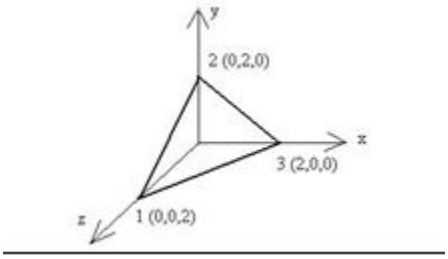


9.a) Derive one dimensional steady state heat conduction equation.

b) An axisymmetric triangular element is subjected to the loading as shown in fig. the load is distributed throughout the circumference and normal to the boundary. Derive all the necessary equations and derive the nodal point loads.



10. a)Determine the strain displacement matrix for the TETRAHEDRAL element as shown in fig



b) Explain the concept of numerical integration and its utility in generating Isoperimetric finite element matrices

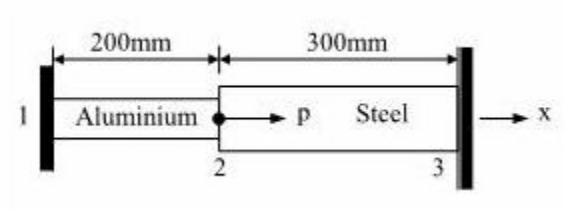
OR

11. a) What are the necessary requirements for convergence and explain about h- and p

requirements

b) Derive the stiffness matrix for truss element in case of linear and quadratic shape functions At 20^0 C an axial load P = 300 x 10^3 is applied to the rod as shown in Fig. The temperature is then raised to 60^0C. Assemble the element stiffness matrix and the element temperature force matrix (F).Again determine the nodal displacements and element stresses. Also find element strains. Assume E_1= 70 x 10^9 N/m^2, $_1$= 900 mm^2, α_1 = 23 x 10^{-6}/ ^{0}C, E_2 = 200 X 10^9 N/m^2 , A_2 = 1200

mm^2 ,α 2= 11.7 x 10^{-6} / ^{0}C.


200mm
300mm
1
Aluminium
p
Steel
x
2
3

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
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MODEL QUESTION PAPER – II

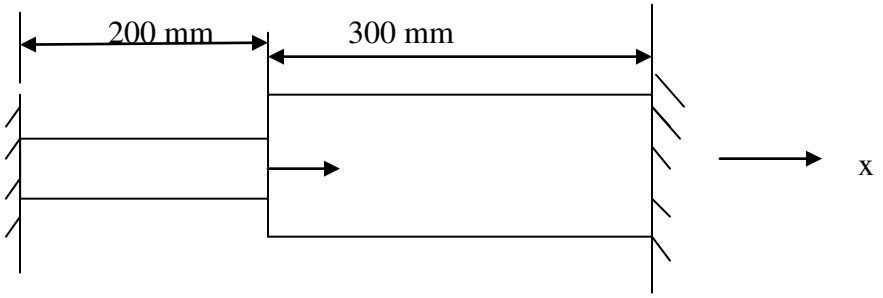
Year: III YR II SEMESTER **SUB: FINITE ELEMENT METHODS**

PART A **(25 MARKS)**

1. a. What is FEM (2M)
   b. Write the advantages of FEM (3M)
   c. What is CST (2M)
   d. Write the strain relations of three dimensional system (3M)
   e. What is local coordinate System (2M)
   f. Write the Eigen values and Eigen vectors for a stepped bar (3M)
   g. What is the degree of freedom for the thermal problems (2M)
   h. Define principle of virtual work. Describe the FEM formulation for 1D bar element (3M)
   i What is dynamic analysis (2M)
   j. Discuss Mess generation(3M)

PART B **(10X5=50 MARKS)**

2.. a) Differentiate among Bar element, Truss element and Beam element indicating D.O.F and geometry
characteristics.
b) An axial load P =$300X10^3$N is applied at 20^0 C to the rod as shown in Figure below. The temperature is the raised to 60^0 C a) Assemble the K and F matrices
b) Determine the nodal displacements and stresses



$E_1=70X10^9N/mm^2$ $E_2=200X10^9N/mm^2$
$A_1=900mm^2$ $A_2=1200mm^2$

$\alpha_1=23X10^{-6}$ $\alpha_2=11.7X10^{-6}$

3. a) Discuss in detail about the concepts of FEM formulation How is that emerged as powerful tool. Discuss in detail about applications of finite element method
b) Derive an equation for finding out the potential energy by Rayleigh –Ritz method Using

Rayleigh – Ritz method, find the displacement of the midpoint of the rod shown in Fig. Assume E = 1,A=1,ρg=1 by using linear and quadratic shape function concept

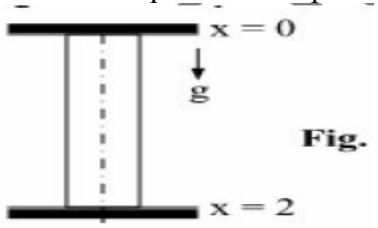


Fig.

4 a) Discuss in detail about Linear and Quadratic shape functions with examples

b) Consider axial vibration of the Aluminum bar shown in Fig., (i) develop the global stiffness and (ii) determine the nodal displacements and stresses using elimination approach and with help of linear and quadratic shape function concept. Assume Young's Modulus E = 70Gpa

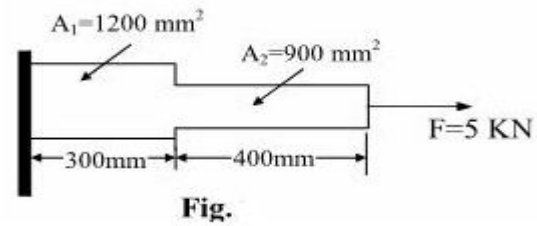


Fig.

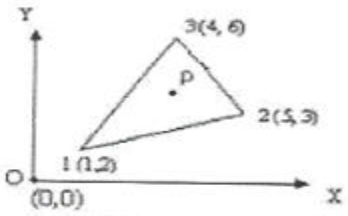
OR

5. a)Describe Rayleigh-Ritz method

b) Abeam is fixed at one end and supported by roller at the other end has 20KN load applied at the center of the span of 10m.Calculate deflection and slope and also construct shear fore and bending moment diagrams

6. a) State the properties and applications of CST

b)The nodal coordinates of the triangular element shown in figure at the interior point P.the x coordinate is 3.3 and the shape function at node 1 is $N_1$is 0.3.determine the shape functions at nodes 2 and 3 also find the 'y' coordinate of P



OR

7. a) Determine the stiffness and Jacobian matrix for the iso parametric quadrilateral element starting

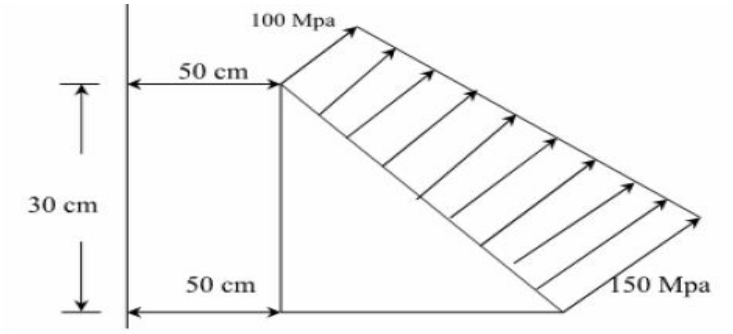
from fundamentals.

b) Differentiate between axi- symmetric boundary condition and polar symmetric boundary condition.

c) Derive the load vector for the axi-symmetric triangular element with the variable surface load on the surface.

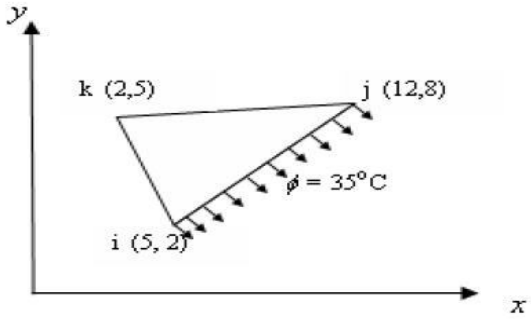
8. a) derive one dimensional steady state heat conduction equation

b)An axi symmetric element subjected to loading as shown in figure .The load is distributed througout the circumference and normal to the boundary. Derive all necessary equations and derive nodal point loads



OR

9. Calculate the conductance matrix [K(e)] and load vector fF(e)g for the triangle element shown in figure 8. The thermal conductivities are kx = ky = 4 W=cm□0C and h = 0.3 W/cm2 0C. Thickness of the element is 1cm. All coordinates are given in cms. Convection occurs on the side joining modes i and j.



10. For the stepped bar shown in figure develope the global stiffness matrix and mass matrices and determine the natural frequencies and mode shapes Assume E=200GPa and mass density is 7850 Kg/m^3 L_1=L_2=0.3 m A_1=350 $mm^2$and A_2 =600 mm^2

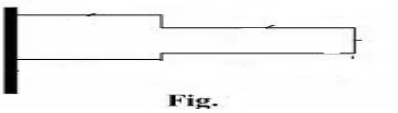


Fig.

OR

11. a)Derive the shape functions for the four noded tetrahedron element from the first principles
b)discuss the importance of semi automatic meshing and practical applications

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MODEL QUESTION PAPER – III

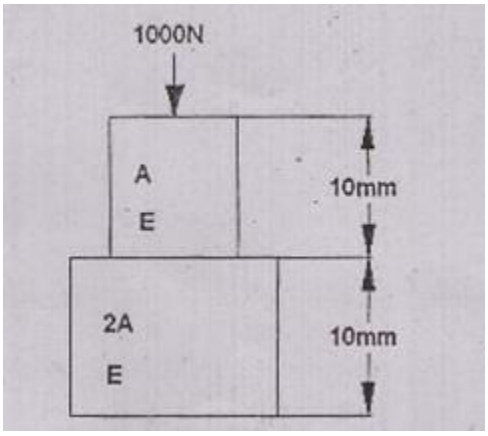
Year: III YR II SEMESTER **SUB: FINITE ELEMENT METHODS**

PART A **(25 MARKS)**

1. a. List the various weighted residual methods (2M)
   b. Write the properties of shape function (3M)
   c. What the advantages of natural coordinate system (2M)
   d. Write analogies between structural, heat transfer and fluid mechanics (3M)
   e. Name few FEA packages (2M)
   f. Derive the mass matrix for a 1D linear bar element (3M)
   g. What are the properties of stiffness matrix (2M)
   h. Explain about plain stress and plain strain conditions (3M)
   i. Write down the conduction matrix for a three noded triangular element (2M)
   j. Distinguish between Error in solution and Residual (3M)

PART B (10X5=50)

2. a)Determint the nodal displacement ,stress and strain for the bar shown in fig



b) Using potential energy approach, describe FE formulation for plane truss Element

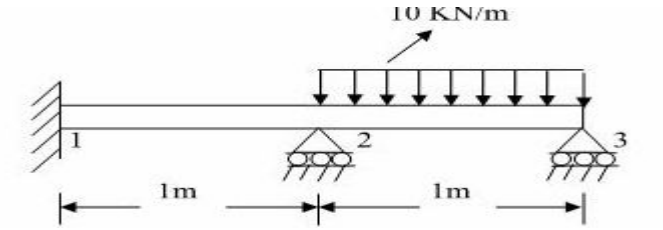
OR

3. a) Solve the differential equation for the physical problem expressed as $d^2y/dx^2+100=0$when 0=x=10 with boundary condition as y(0)=0 and y(10)=0 using i) point collocation ii) sub-domain collocation iii) least square method

iv) galarkin method.

b) Explain the concept of FEM briefly .outline the steps involved in FEM along with applications

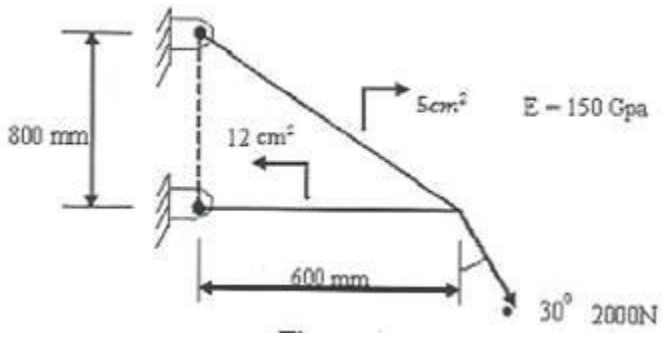
4. a)For a beam and loading shown in fig., determine the slopes at 2 and 3 and the vertical deflection at the midpoint of the distributed load



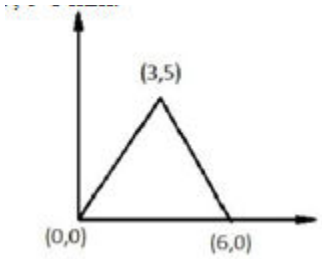
b) Establish the shape functions for a 3 – noded triangular element.

OR

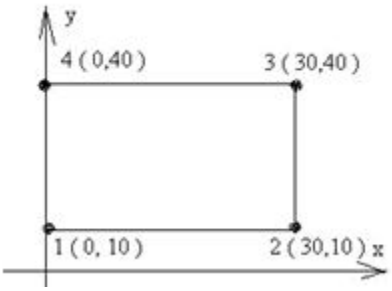
5. Calculate the nodal displacement, stresses and support reactions for the truss shown in figure



6.a) Evaluate the element stiffness matrix for the triangular element shown under plane strain condition. Assume the following values E=200 GPa, μ=0.25, t=1 mm



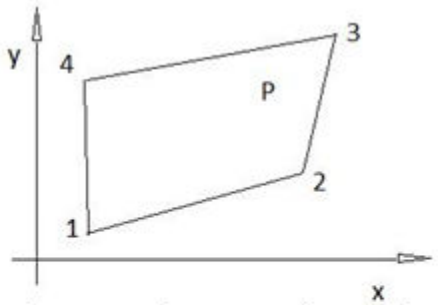
b) For the element shown in the figure, assemble Jacobian matrix and strain displacement matrix



OR

7. a) Derive the a)shape function and b) strain displacement matrices for triangular element of revolving body

b) for the Isoparametric quadrilateral element shown in fig , determine the local co-ordinates of the point P whose Cartesian co=ordinates as(6,4)

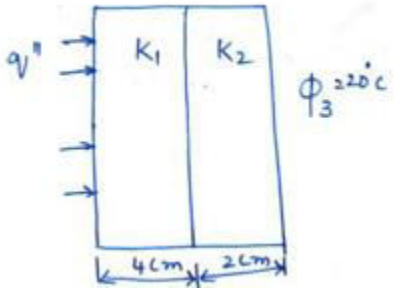


node	x	y
1	2	1
2	5	2
3	7	6
4	1	5

8 a) Determine the temperature at the nodal interfaces for the two layered wall shown in fig.the left face is supplied with

heat flux of Q^{11}=5 W/cm^2 and the right face is maintained at 20^0C

Q^u=5w/c
m^2
K_1=0.2W/cm^{u}C
K_2=0.06W/cm^{u}C
A=1cm^2.

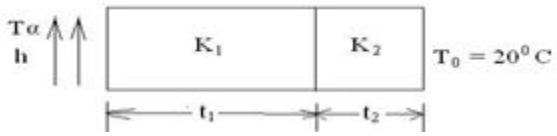


b) Derive the Strain displacement Matrix for 2D-Thin plate. Consider the temperature field with in the triangular element is given by T= $N_1T_1 + N_2T_2 + N_3T_3$

OR

9. Determine the temperature distribution through the composite wall shown in figure, when convection heat loss occurs on the left surface. Assume unit area Assume wall thickness t_1 = 4cm, t_2 = 2cm, k_1 = 0.5w/cm^{0}c, k_2 = 0.05w/cm^{0}c

h= 0.1w/cm$^{2\,0}$c and T_α= -5^{0}c



10. a) Determine the eigen values and the associated Eigen vectors of the matrix [A] given by

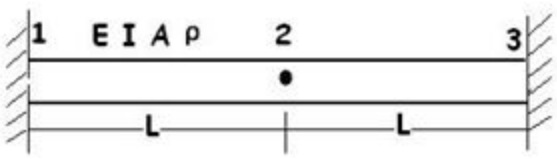
$$A = \begin{bmatrix} 3 & 4 \\ 4 & -3 \end{bmatrix}$$

b) State the properties of Eigen Values.

OR

11.a) Explain difference between Lumped Mass and Consistent Mass

b) Determine the Natural frequency of the beam shown in the figure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MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF AERONAUTICAL ENGINEERING
MODEL QUESTION PAPER – IV

Year: III YR II SEMESTER **SUB: FINITE ELEMENT METHODS**

PART A **(25 MARKS)**

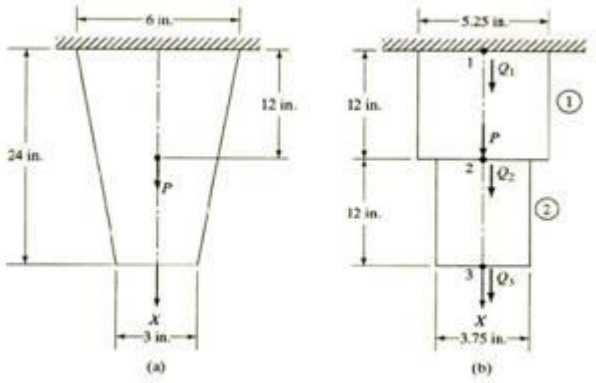
1. a. Give the limitations of FEM. (2M)
   b. Briefly explain the role of shape function FEM analysis (3M)
   c. Write a short note on numerical integration. (2M)
   d. What do you understand by discritisation of the domain (3M)
   e. What is Jocobian matrix (2M)
   f. Determine the matrix relating strains and nodal displacements for an axisymmetric triangular element. (3M)
   g. What is difference between CST and LST (2M)
   h. What are the ways by which a 3D problem can be reduced to a 2D problem (3M)
   i. Name Few FEA packages (2M)
   j. Derive the convection matrix for a 1D linear bar element (3M)

PART B **(10X5=50)**

2. a) Write down expressions for the element stiffness matrices and element body force vectors

b) Evaluate the stresses in each element Determine the reaction force at the support. consider 1in=1cm for SI UNITS

a



OR

3.a) Determine the nodal displacement, Element stresses f r axially loaded bar as shown in the fig. below

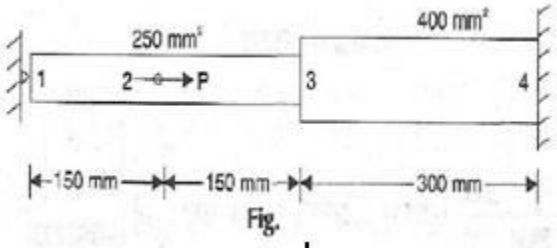
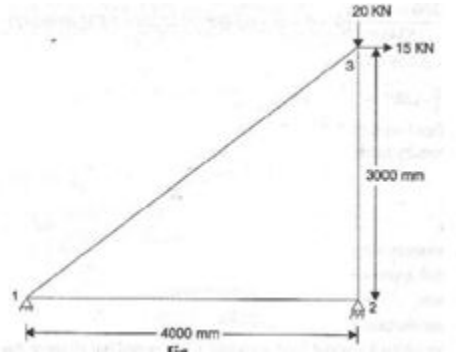


Fig.

b) Explain the elimination method and penalty method for imposing specified displacement boundary conditions

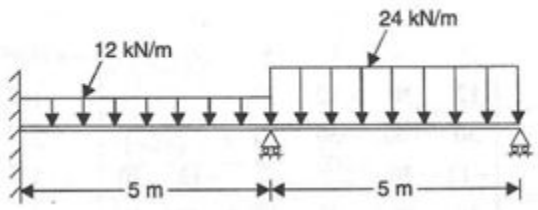
4. a) Obtain the forces in the plane Truss shown in Figure below and determine the support reactions also. Take E=200GPa and A= 2000mm^2



b) Derive the Hermite shape functions for beam element.

OR

5.a) Analyze the beam shown in Figure method and determine the end reactions. Also determine the below by finite element deflections at mid spans given E=2X10^{5}N/mm^2, and I=5X10^6 mm^4



b) What are the general features of a bar Element?

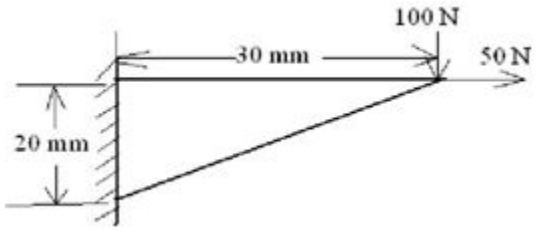
6. a) Formulate the finite element equations for Constant strain triangle shown in fig. Assume plane stress E=200Gpa,ν=0.25,thickness=5mm,nodal co-ordinates. Pressure on 1-2 edge is 5N/mm2

X1=1	X2=5	X3=3
Y1=2	Y2=4	Y3=6

b) Write the Advantages of iso-parametric elements

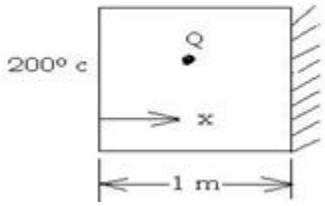
OR

7.a) For the configuration shown in figure, determine the deflection at the point load application using a one element model. T = 10 mm , E = 70 G Pa ,ν = .3



b) Derive the strain displacement matrix for triangular element.

8. a) The plane wall shown in fig. The thermal conductivity K = 25 $/m^0C$ and there is a uniform generation of heat in the wall Q = 400 W $/m^3$. Determine the temperature distribution at five nodes (include two sides of the walls) in equal distances through the wall thickness

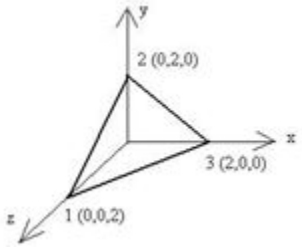


b) Derive Approximate the first two natural frequencies of a cantilever beam using one element model. EI=Flexural rigidity

9. a) A metallic fin with thermal conductivity K=360W/m^0c, 1mm thick and100mm long extends from a plane wall whose temperature is 235^0c. Determine the distribution and amount of heat transferred from the fin to air at 20^0c with h= 9W/m^{20}c take width of the fin is 1000 mm. Assume tip is insulted

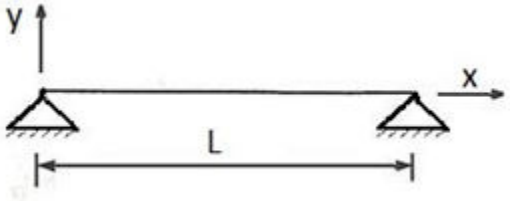
b) Explain the concept of numerical integration and its utility in generating Isoperimetric finite element matrices

10.a) Determine the strain displacement matrix for the TETRAHEDRAL element as shown in fig



.

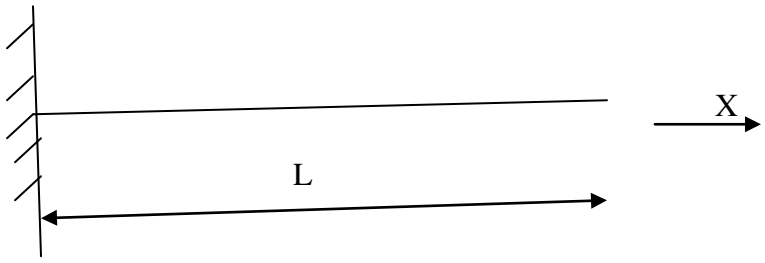
b) Determine the approximate first two natural frequeneves of a simply supported beam using on a element. Flexural Rigidity =EI; Density = Ƥ Cross-sectional area=A



OR

11.a) State the method used for obtaining natural frequencies and corresponding eigen vectors.

b) Evaluate natural frequencies for the CANTI LEVER beam shown in fig USING ONE ELEMENT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MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF AERONAUTICAL ENGINEERING
MODEL QUESTION PAPER – V

Year: III YR II SEMESTER **SUB: FINITE ELEMENT METHODS**

PART A (25 MARKS)

1. a. What is the principle of FEM (2M)
   b. Write the stress strain relations for 2D plane stress and pane strain conditions (3M)
   c. Differentiate between truss and beam element based on degree of freedom. (2M)
   d. What is Hermite shape function (3M)
   e. Write the formula for the load vector of triangular element subjected to body force(2M)
   f. What is the size of stiffness matrix for axisymmetric triangular element (3M)
   g. What is the degree of freedom for the thermal problems (2M)
   h. Where do you apply (3M)
   i. Name Few FEA packages (2M)
   j. Explain the importance of lumped mass matrix (3M)

PART B 10X5=50

2. a)Why polynomial type of interpolation function is preferred over trigonometric functions? Explain

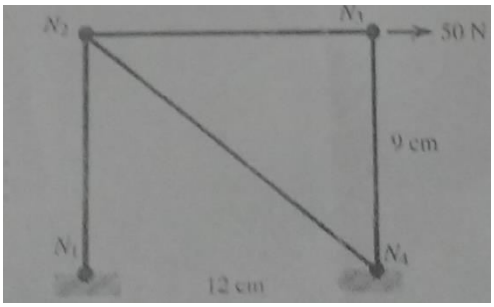
b)Draw the Pascal's triangle and Pascal's tetrahedron for understanding the interpolations functions. Explain the salient features

OR

3. a)Explain the steps involved in obtaining an appropriate solution using AEM

b) Explain the equilibrium state of the system, when the system is subjected to different types of loads and explain the stress and equilibrium relations

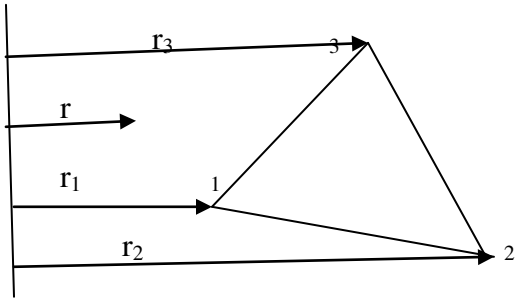
4.For a two dimensional structure as shown in figure. determine displacement of the nodes and normal stresses developed in the members using FE. Use E = 39x 106 N/cm2 and the diameter of the cross-section of 0.25 cm.



OR

5. A beam is fixed at one end and supported by a roller at the other end, has a 20 KN concentrated load applied at the center of the span of 10 m. Calculate the deflection and slope and also construct shear force and bending moment diagrams and take I=2500 cm^4

6.a) Evaluate the axisymmetric stiffness matrix K of the triangular element shown in the figure .Consider the coordinates of the nodes (2,1), (4,00, and (3,2).also assume E= 2.6 GPa and v=0.2



b) Difference between CST and LST with respect to the triangular element.

OR

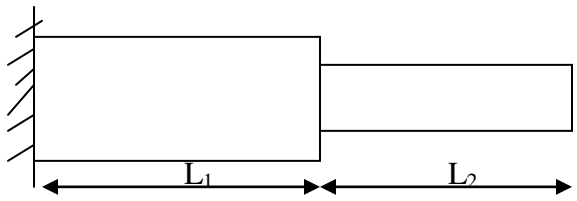
7.Derive the stiffness matrix for the four noded quadrilateral element in terms of natural coordinate systems

8.consider a brick wall of thickness 0.3 m ,k=0.7 W/m/K. The inner surface is at 28^0C and the outer surface is exposed to cold air at -15^0C.The heat transfer coefficient associated with the outside surface is 40W/m^2K.Determine the steady state temperature distribution within in the wall and also the heat flux through the wall. Use two elements and obtain the solution

OR

9.Derive the conductivity matrix for two dimensional triangular element subjected to convection on one face of the element

10. For the stepped bar shown in figure. Develop the global stiffness and mass matrices and also determine the natural frequencies and mode shapes. Assume E=200 GPa and mass desity =7850 Kg/m^3 $L_1=L_2=0.3$ m $A_1=350mm^2$ $A_2=600$ mm^2



OR

11.a)Derive the shape functions for the four noded tetrahedron element from the first principle

b)discuss the importance of semi automatic meshing and auto mesh along with the practical applications

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING
CONCEPTUAL DESIGN OF FLIGHT VEHICLES (R 13)

MODEL PAPER – I
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1) Explain about the design wheel with sketch (3M)
2) Define take-off weight build up (3M)
3) What is rubber engine sizing (3M)
4) Explain about fuel fraction estimation (2M)
5) Define conic lofting (3M)
6) Explain supersonic area rule with fig (3M)
7) Define installed engine thrust (2M)
8) Define scale factor and list out the equations which show how length ,diameter , and weight vary with the scale factor for the typical jet engine (2M)
9) Explain NACA flush – inlet with a neat fig (2M)
10) Define the phases of aircraft design using flow diagram (2M)

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question answer (irrespective of the bits) carries 10M.

11) Explain Thrust Matching

OR

12) Explain about Empty Weight Estimation and Fuel Fraction Estimation

13) Give a detailed note on the following performance parameter that effect the wing loading – wing loading for cruise and loiter

OR

14) Explain about the Thrust –To Weight Ratio and Wing Loading

15) Write the equation for rubber engine sizing

OR

16) What is Radar Detect ability explain in detail with fig

17) What do you understand by capture area calculation

OR

18) Explain propulsion system selection with req fig

19) Explain about fuel system design and integration

OR

20) Explain in detail about the Tail geometry and arrangement with neat sketches

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING
CONCEPTUAL DESIGN OF FLIGHT VEHICLES (R 13)

MODEL PAPER – II
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1) Explain specific fuel consumption (2M)
2) Define range (2M)
3) Explain geometry sizing (3M)
4) Explain about flat-wrap fuselage lofting (3M)
5) What is infrared detect ability (3M)
6) Define takeoff-weight buildup (3M)
7) What is bypass ratio (3M)
8) Draw and explain in short about the jet engine locations at nose and chin (2M)
9) Write a short notes on podded engines (2M)
10) List out the types of nozzles and explain them in two to three sentences with a neat sketches (2M)

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question answer (irrespective of the bits) carries 10M.

11) Explain in detail the conceptual design phase in aircraft design

OR

12) Explain mission profiles with a neat sketch and also explain mission segment weight fractions for simple cruise

13) Explain in detail about the airfoil geometry with req sketches

OR

14) How wetted area and volume determination is estimated

15) Explain in detail about the structural considerations in special considerations in configuration layout with neat figures

OR

16) Explain about the design configuration of crew station, passenger compartment, and cargo provisions

17) What are aural signature and vulnerability considerations

OR

18) Explain in detail about the boundary-layer diverts with neat sketches

19) Explain in detail about gear retraction geometry

OR

20) Explain about Aircraft subsystems

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
CONCEPTUAL DESIGN OF FLIGHT VEHICLES(R 13)

MODEL PAPER – III
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1) Define drag polar (2M)
2) Write about the subsonic lift-curve slope with sketch (2M)
3) Define leakage and protuberance drag (3M)
4) Define Oswald span efficiency factor (3M)
5) Define young's modulus (2M)
6) Explain about the trim condition (2M)
7) Define level flight (2M)
8) Define stick – free stability (3M)
9) Write the equation for range optimization-jet and prop (3M)
10) How the fuel and oil cost is estimated (3M)

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question answer (irrespective of the bits) carries 10M.

11) Explain the handling qualities of cooper-Harper scale

OR

12) Explain about the landing analysis of an aircraft with neat figures

13) Explain about the improved conceptual sizing methods

OR

14) Explain (a) steady level flight (b)minimum thrust required for level flight (c) loiter endurance

15) Explain about the installed thrust methodology

OR

16) Explain about the air loads due to maneuver loads ,gust loads, air loads due to control deflection

17) Compare the drag polar of a symmetric airfoils and a cambered airfoils

OR

18) Explain refined baseline design and report of specifications

19) Explain about the material selection and material properties for an aircraft design

OR

20) (a) Explain in detail about the maximum lift with high – lift devices

(b) Write a detailed note on component buildup method and component form factors

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
CONCEPTUAL DESIGN OF FLIGHT VEHICLES (R13)

MODEL PAPER – IV
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1) Explain what is RDT&E and production costs (3M)
2) Define stability (2M)
3) Define static lateral directional stability and trim (3M)
4) Explain in short about the carpet plot (3M)
5) Define load factor (2M)
6) Define aerodynamic center (2M)
7) Define propulsion efficiency (3M)
8) Explain in short about gross thrust and net thrust (2M)
9) Explain in short about the aerodynamic forces (3M)
10) Briefly explain about aerodynamic coefficients with fig (2M)

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question answer (irrespective of the bits) carries 10M.

11) Write short notes on (a) Elements of life cycle cost, (b) cost analysis

OR

12) Explain in detail about the Measures of merit?

13) Explain about the sizing matrix and carpet plots with required sketches

OR

14) Explain about Steady climbing and descending flight, best angle and rate of climb, time to climb and fuel to climb with neat sketches

15) Estimate the static pitch stability, velocity stability and trim.

OR

16) Write a note on Piston engine performance ,propeller performance and piston prop thrust corrections

17) Explain in detail about the leakage and protuberance drag ,stopped propeller and wind milling engine drag and supersonic parasite drag

OR

18) Explain about the landing gear loads and three basic structural loadings(structures fundamentals) with neat figures

19) (a) Explain in detail about the wheel load geometry with sketch (b) Bicycle and Tail dragger landing gear arrangements with fig

OR

20) (a) Explain with sketches about shock absorbers – types ,sizing and stroke determination (b) Gear retraction geometry

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
CONCEPTUAL DESIGN OF FLIGHT VEHICLES (R13)

MODEL PAPER – V
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1) Explain the difference between the jet engine locations at chin and side with neat fig (3M)
2) Draw the neat figures of typical mission profiles for sizing (3M)
3) Define design take –off gross weight (3M)
4) Explain about airfoil geometry with a neat fig (3M)
5) Define wing dihedral, wing incidence angle ,taper ratio (3M)
6) Explain about arrested landing (2M)
7) Explain wing fillets (2M)
8) Write a short notes on crew station and passenger compartment (2M)
9) Write a short notes on rigid axle and oleo shock strut gear/shock arrangements (2M)
10) Write about flight envelope , down wash and up wash ` (2M)

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question answer (irrespective of the bits) carries 10M.

11) (a)Explain about take off – weight calculation (b)wing geometry with required sketches

OR

12) Explain about wing geometry with neat sketches

13) Explain in detail about takeoff distance and landing distance in detail

OR

14) Explain in detail about control surface sizing

15) Explain about wing/tail layout and loft

OR

16) Explain in detail about aerodynamic considerations in configuration layout and crashworthiness considerations

17) Explain inlet geometry

OR

18) Explain propeller engine integration with neat sketches

19) Explain in detail about Oswald span efficiency method and leading edge suction method

OR

20) (a)Explain longitudinal static stability and control with required equations and figures
(b)Define rate of climb (jet) Rate of climb (prop), time to climb , level turning flight ,gliding flight with necessary equations .

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING
AEROSPACE PROPULSION-II
MODEL PAPER – I
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1) What is TAV? What are the categories of TAVs?
2) Define a Hypersonic Vehicle. State different types of hypersonic vehicles.
3) Define and differentiate between total impulse and specific impulse.
4) Define and differentiate between mass fraction and propellant mass fraction.
5) Explain how geo-stationary orbit is different from geo-synchronous orbit.
6) State the rocket equation and explain the dependence of ΔV on jet velocity and mass ratio.
7) Explain spillage drag in hypersonic transport vehicle.
8) Explain the relevance of C*and C_F of a solid rocket engine
9) State the advantages of scramjet engines in military and civil applications.
10) Explain the role of space launch vehicles.

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question carries 10M.

1) (a) What are the enabling Technologies essential for high speed vehicles?
(b) Explain the problems of combustion in high speed flow.

OR

(a) What are the challenges faced by trans-atmospheric air-breathing engines.
(b) With a neat diagram, explain the functioning of a LACE engine.

2. (a) How are high speed propulsion systems classified?

b) Explain the working principles of the Electric Propulsion systems.

OR

Write short notes on the following:

- Thermal Throat
- Supercritical operation of scramjet inlet
- Function of Isolator in scramjet engine
- Types of military missiles

3) a) Define specific impulse, total impulse, mass ratio, propellant mass fraction and the effective exhaust velocity of a rocket vehicle

b) Why do we need a combined cycle engine? With a neat sketch explain the working of a Air Turbo Rocket (ATR) engine

OR

a) Explain the need for combined cycle engines

b) Explain the need for distributed fuel injection in a Scramjet engine

4) Differentiate between a rocket and missile

OR

Derive an equation for the incremental velocity of rocket (Rocket Equation). State the assumptions made, if any

5) With a neat sketch, explain the working concept of a MHD-Scramjet energy by-pass.

OR

Explain the effects of vacuum on space vehicles

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING
AEROSPACE PROPULSION-II
MODEL PAPER – II
MAXIMUM MARKS: 75

Part A

Answer all questions **25 Marks**

1. Differentiate between total impulse and specific impulse
2. Define Thrust Coefficient and characteristic velocity. How are effective exhaust velocity, thrust coefficient and characteristic velocity inter-related?
3. Explain how geo-stationary orbit is different from geo-synchronous orbit.
4. State the Tsiolkovsky's Rocket equation and explain the deductions that can be made from the rocket equation.
5. State Breguet's range equation. Explain the parameters which influence the range.
6. Explain the factors that decide the exhaust velocity of a chemical rocket engine
7. Differentiate between under-expanded and over-expanded nozzle operation.
8. What do you understand by multiphase flow in the nozzle? How does it effect nozzle performance?
9. Briefly explain the operation of solid core nuclear rocket with a neat sketch.
10. What is meant by guaranteed minimum performance

Part B

All Questions carry equal marks **50 Marks**

1. (a) Describe the purpose of a space launch vehicle. Explain the basis on which space launch vehicles are classified.
   (b) Explain the need for Trans-atmospheric vehicle. What are the enabling technologies essential for hypersonic speeds?

   or

   (a) Explain the effect of atmosphere and near vacuum conditions on the performance of space vehicles.
   (b) Explain the functioning of a Scramjet-MHD Energy By-pass system with a neat diagram.
2. Explain the concept and use of Dual-mode engines. With neat diagrams of the shock pattern in the isolator, explain the operation of the dual-mode Ram/Scram jet engine.

   Or

   Write Short notes on
   (a) Spillage drag and plume drag
   (b) Limitations of turbojet/ram jet engines at high speeds
   (c) Need for integrated Airframe-Engine design for Scram jet aircraft and problems associated with such integrated design
3. (a) What are the requirements of chemical rocket propellants?
   (b) Define and differentiate between heat of reaction and heat of formation in thermo-chemical analysis of combustion.

Or

(a) Explain the four sets of conditions under which rocket engine performance is computed.

(b) What is meant by chemical equilibrium of the expansion process? Differentiate between frozen equilibrium and shifting equilibrium conditions in the expansion process.

4. (a) Compare solid propellant systems with liquid propellant systems and mention their comparative advantages and usage.

(b) What is the difference between velocity increment and the actual velocity of the vehicle? What are the different components of delta V?

or

(a) What is the function feed system in a liquid propellant rocket system. Explain working of different feed systems with a neat diagram

(b) Explain the concept of Single Stage to Orbit (SSTO). What are the advantages of SSTO?

5. a) What are the advantages of electrical propulsion engines (thrusters) over chemical rocket engines?

b) Explain the concept of propellant-less propulsion? Explain briefly the function of a interstellar ramjet with a neat diagram

Or

(a) Explain briefly the operating principles of different types of electrical thrusters. With a neat diagram, explain the operation of a Hall Effect Thruster

(b) Write short notes on the following:

Types of space tethers
MEMS technology

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING
AEROSPACE PROPULSION-III
MODEL PAPER – I
MAXIMUM MARKS: 75

PART A

ANSWER ALL THE QUESTIONS **25 M**

1. Differentiate between a rocket and missile
2. Explain the relevance of C*and C_F of a solid rocket engine
3. What is TAV? What are the categories of TAVs?
4. Define a Hypersonic Vehicle. State different types of hypersonic vehicles
5. Explain the formation of thermal throat in a scram jet engine
6. Explain different types of combustion instabilities in solid propellant rockets.
7. What is erosive burning? Explain typical pressure-time curve with and without erosive burning.
8. Draw pressure-time curves for a solid propellant grain showing progressive, neutral and regressive burning rates.
9. What is Reaction control system (RCS)? Explain the need for an RCS system.
10. The space-charge limitation of Ion Thruster

PART B

1. a) Explain the problems of combustion in high speed flow
b) Explain the need for a Single Stage to Orbit (SSTO) vehicle. State the advantages and limitations of SSTO vehicle.

or

(a) What are the challenges faced by trans-atmospheric air-breathing engines.

(b) With a neat diagram, explain the functioning of a Ramjet engine

2. (a) Explain the need for supersonic combustion beyond flight speeds of Mach 4.0.

(b) With a neat sketch, explain the operation of a Scram Jet engine.

or

(a) Explain the function of the Isolator in a Scram jet engine.

(b) Explain the working principle of a dual-mode scram jet engine

3. (a) What is the function of a Reaction Control System (RCS). State different maneuvers conducted by RCS.

(b)Define and describe various correction factors used in computing the performance parameters of a chemical rocket system.

Or

(a) Derive an equation for the incremental velocity of a rocket (rocket equation). State the assumptions made, if any
(b) Explain the limitations of chemical rocket propulsion systems. How can the limitations be overcome?

4. (a) Discuss the desirable characteristics of solid propellants.

(b) Define solid propellant burning rate. What are the parameters that control the burning rate. Explain the effect of propellant grain temperature on the burning rate

or

(a) What is the function of an injector in liquid propellant rocket? Explain different types of injectors used.

(b) What is the primary objective of cooling of thrust chambers in liquid propellant rocket motors?
Explain different cooling methods used.

5. Explain the operation of Resisto-jet and Arc-jet engines with neat diagrams. What are applications of electro-thermal thrusters?

Or

Write short notes on:
(a) Inter-relation between vehicle velocity and structural/propellant mass
(b) Space Tethers
(c) Break through propulsion
(d) Nuclear propulsion

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING
AEROSPACE PROPULSION-II
MODEL PAPER – IV
MAXIMUM MARKS: 75

Part A

1. Define the terms total impulse and specific impulse, explaining the difference between them
2. How are effective exhaust velocity, thrust coefficient and characteristic velocity inter-related?
3. Define a Hypersonic Vehicle. State different types of hypersonic vehicles
4. What are the different types of orbits? Draw neat diagrams**.**
5. What are the parameters which influence the range in the Breguet's range equation .
6. Explain the factors that decide the exhaust velocity of a chemical rocket engine
7. Explain spillage drag in hypersonic transport vehicle
8. With a neat diagram, indicate different type of drags in a scamjet engine
9. Briefly explain the operation of solid core nuclear rocket with a neat sketch.
10. Explain the term guaranteed minimum performance

Part B

Answer all questions

1. Explain the need for a Single Stage to Orbit (SSTO) vehicle. State the advantages and limitations of SSTO vehicle.

   OR

   What are the challenges faced by trans-atmospheric air-breathing engines.

2. Explain different types of high speed propulsion system. What is the basis of their classification?

   OR

   Draw a neat sketch of a scramjet engine and explain the function of each component

3. Define and describe various correction factors used in computing the performance parameters of a chemical rocket system.

   OR

   Explain need a combined cycle engine? With a neat sketch explain the working of Air Turbo Rocket (ATR) engine

4. What is the meaning of the term delta V? Differentiate between incremental velocity and actual velocity of the rocket.

   OR

   What are different types of feed systems in liquid propellant rocket. Draw a neat diagram and indicate different parts.

5. Explain different types of Electrical propulsion systems. With a neat diagram, explain the functioning of a Ressisto-jet propulsion system.

   Or

   Write short notes on
   (a) MIMS
   (b) Breakthrough Propulsion
   (c) MHD accelerator

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING
AEROSPACE PROPULSION-II
MODEL PAPER – V
MAXIMUM MARKS: 75

Part A

1. What is the differnce between a rocket and missile
2. Define characteristic velocity and thrust coefficient of a solid rocket engine
3. Explain the difference between total impulse and specific impulse.
4. Define and differentiate between mass fraction and propellant mass fraction.
5. What is a thermal throat in a scram jet engine
6. State different types of combustion instabilities in solid propellant rockets.
7. Draw pressure-time curves for a solid propellant grain showing progressive, neutral and regressive burning rates.
8. Explain the need for Reaction control system (RCS)?
9. What is meant by the space-charge limitation of Ion Thruster?
10. State different types of propulsion systems. What are the basis on which they are classified?

Part B

Answer all questions

1. Explain the functioning of a LACE engine with a neat diagram.

   OR

   What are difficulties encountered in high speed combustion?
2. What is the need for distributed fuel injection in scramjet engines? Explain with suitable diagrams.

   OR

   Explain the functioning of combined cycle engine with a neat diagram.
3. What are the limitations of chemical rocket propulsion systems. How can the limitations be overcome?

   OR

   Explain the four sets of conditions under which rocket engine performance is computed
4. Explain the term incremental velocity of rocket (Rocket Equation). Derive an equation for the same, indicating the assumptions made, if any

   OR

   Outline the differences between SPR and LPR highlighting their applications
5. What are differences of Chemical rocket systems and Electricl rocket systems? Explain the functioning of a Arc-Jet engine with a neat diagram

   OR

   Explain the functioning of a Hall Effect thruster with a neat diagram. What are the applications of Hall Effect Thrusters?

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING

AIRCRAFT SYSTEMS
MODEL PAPERS-1

Answer all the questions: 25M

1. Enumerate different types of aircraft systems. [3]
2. Explain about any one Mission system of transport aircraft. [2]
3. Explain about reverse bootstrap system. [2]
4. Explain about g-tolerance. [3]
5. Explain electrical loads of an aircraft. [2]
6. Explain about DC-link. [3]
7. Brief about accumulator working principle. [3]
8. Brief about Landing gear operation. [2]
9. List out the typical start sequence. [3]
10. List out the mode of operation of fuel systems. [2]

Answer any one from each section: 50M

1. Classify and discuss about the a/c systems [10]

   (or)

   Explain the integration of a/c system on process , information, and function levels with required sketches and tables. [10]
2. Explain in detail the electrical system components and working with a schematic diagram [10]

   (or)

   Explain in detail FBW system its components nomenclatures by taking any example.
3. Explain the components and working principle of a hydraulic system. [10]

   (or)

   Explain the brake management system with neat sketches. [10]
4. Explain about refrigeration systems and types with neat sketches [10]

   (or)

   Explain the process and types of passenger & crew evacuation/ejection system .
5. Explain in detail various modes of fuel system [10]

   (or)

   Explain the engine control evolution, fuel flow control, control system parameter with some examples. [10]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING

AIRCRAFT SYSTEMS
MODEL PAPERS-II

Answer all the questions: 25M

1. Enumerate levels of integration of aircraft systems at component levels. [3]
2. Explain about any one Mission system of fighter aircraft. [2]
3. Brief about the bleed air [3]
4. Brief about air cycle refrigeration. [2]
5. Brief about primary and secondary control systems of a/c. [3]
6. Brief about a cyclo converter working priciple. [2]
7. Enumerate the basic components of hydraulic system. [2]
8. Discuss about reservoir, pump and its working principle. [3]
9. List out the main components of fuel system. [2]
10. Explain about functions of sensors in engine control system. [3]

Answer any one from each section: 50M

1. Explain the purpose, location brief description, aspects/safety of navigation & cockpit displays systems with sketches and tables showing 3 examples each. [10]

   (or)

   Explain the drivers in the product of environment operating environment. [10]
2. Explain the working of a pneumatic system with a neat sketch [10]

   (or)

   Explain about ram air cooling and fuel cooling with sketches. [10]
3. Explain the flight primary and secondary flight controls for civil and fighter a/c. [10]

   (or)

   Explain the terms

   a. Cyclo-converter b. DC-link c. Generator d. VSCF [3,2,3,2]

4. Explain the terms with sketches

   a. Accumulator b. Relief Valve c. Pump d. reservoir [3,2,3,2]

   (or)

   Explain what do you mean by redundancy, types and applications. [10]
5. Explain the factors involved in engine starting control. [10]

   (or)

   Explain the terms

   a. Booster pumps b. Transfer valves c.NRV d. fuel gauging probes [3,2,3,2]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING

AIRCRAFT SYSTEMS
MODEL PAPERS-III

Answer all the questions: 25M

1. Explain about ADF working with a sketch. [3]
2. Explain about ILS & MLS [2]
3. Explain about Cyclo converter. [2]
4. Explain about Load protection. [3]
5. Explain anti-ice technique. [2]
6. Explain molecular sieve oxygen concentrator. [3]
7. Explain the functions of reservoir. [3]
8. Brief about importance of redundancy [2]
9. List out the typical start sequence. [3]
10. List out the mode of operation of fuel systems. [2]

Answer any one from each section: 50M

1. Discuss on:
   Airframe Systems Vehicle Systems Avionics Systems Mission Systems [2, 3 ,2 ,3]
   (or)
   What are the level of integration involved in aircraft production. [10]
2. Explain the following
   Primary & Secondary flight control [6]
   Control linkages [4]
   (or)
   Explain the terms: Power conversion, VSCS, DC link. [4,3,3]

3. Explain the basic principle on which hydraulic system works? What are the main components of hydraulic system? [10]
   (or)
   Explain the landing gear system operation with neat sketches. [10]
4. Explain about air refrigeration systems and types with neat sketches [10]
   (or)
   Explain the process and types of passenger & crew evacuation/ejection system .
5. Explain in detail control of fuel flow and air flow [10]
   (or)
   Explain the engine control evolution, fuel flow control, control system parameter with some examples. [10]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING

AIRCRAFT SYSTEMS
MODEL PAPERS-IV

Answer all the questions: 25M

1. Enumerate levels of integration of aircraft systems at system levels. [3]
2. Explain about any one avionics system of fighter aircraft. [2]
3. Brief about the fuel cooling [3]
4. Brief about Pitot static system. [2]
5. Brief about how actuation is important in control surface. [3]
6. Brief about a cyclo converter working priciple. [2]
7. Explain the types of pumps used in a/c. [2]
8. Discuss about reservoir, pump and its working principle. [3]
9. List out the main components of fuel system. [2]
10. Explain about functions of sensors in engine control system. [3]

Answer any one from each section: 50M

1. Explain how the operating environment conditions of an aircraft are maintained. [10]
   (or)
   Discuss the aspects of safety and integrity of aircraft for any 4 systems. [10]
2. Explain the working of a cabin pressurization system with a neat sketch [10]
   (or)
   a. Explain about g-tolerance and protection with sketches. [3]
   b. Explain working and principle of boots trap and reverse bootstrap [7]
3. Explain the electrical load management systems. [10]
   (or)
   Explain the terms
   a. Load protection b. DC-link c. Generator d. Redundancy [3,2,3,2]
4. Explain in detail the flight control actuation importance and need
   (or)
   Explain what do you mean by redundancy, types and applications. [10]
5. Explain the full authority and limited authority control systems. [10]
   (or)
   Explain the terms
   a. Exhaust gas flow b. Fuel flow control [5,5]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH II SEMESTER – AERONAUTICAL ENGINEERING

AIRCRAFT SYSTEMS
MODEL PAPERS-V

Answer all the questions: 25M

1. Explain about integration. [3]
2. Explain about any one vehicle system of transport aircraft. [2]
3. Explain about VSCS. [2]
4. Explain about spoiler and flap. [3]
5. Explain reservoir and pump functions. [2]
6. Explain the importance of redundancy. [3]
7. Brief about fuel cooling working principle. [3]
8. Brief about cabin pressurization operation. [2]
9. Explain the control of fuel. [3]
10. Explain mode of operations of fuel systems. [2]

Answer any one from each section: 50M

1. Explain about the operating environment conditions [10]

   (or)

   Explain the integration of a/c system on system and function levels with required sketches and tables. [10]
2. Describe electrical system components and working principle with a schematic diagram [10]

   (or)

   Explain in detail FBW system its components nomenclatures by taking any example.
3. Discuss the working principle of a hydraulic system with a neat sketch. [10]

   (or)

   Explain the brake management system with neat sketches. [10]
4. Explain about engine as a source of high pressure operating techniques [10]

   (or)

   Explain the process and types of passenger & crew evacuation/ejection system .
5. Explain in detail various modes of fuel system [10]

   (or)

   Explain the engine control evolution, fuel flow control, control system parameter with some examples. [10]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
INTELLECTUAL PROPERTY RIGHTS (R13)
MODEL PAPER – I
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

iii. All questions in this section are compulsory
iv. Answer in TWO to FOUR sentences.

1. What is intellectual property?
2. Explain the various kinds of intellectual properties
3. Explain the various kinds of intellectual properties laws relating to those properties in India.
4. 'One of the grounds for rejecting an application for registration of trademark is the lack of distinctiveness'. Explain
5. What are the essential features of trade mark?
6. Explain different types of trade marks
7. Write note on "Effects of registration of trade mark
8. Mention some ownership issues in IPR
9. Write about different types of agency in IPR
10. Write about WIPO in detail

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question answer (irrespective of the bits) carries 10M.

11. M and N filed for patent application with provisional specification on the same date for the same invention. After that 'M' filed complete specification much earlier to 'N' but both filed within time allowed. Examine the status of patent application filed by both 'M' and 'N'.

OR

12. State and explain the development of laws on Intellectual property and the benefits on such protection.
13. What is 'mark' ? What are the various steps for registration of Trademark ?

OR

14. What do you mean by infringement of Trademark and discuss the remedies available for infringement.
15. Can the inventor of new process of bypass surgery claim a patent for new surgical method, invented by him ?

OR

16. A foreign applicant of a convention country applies for patent without sufficient description of the invention. The controller accepts the application and grants patent. Decide
17. Explain the grounds for refusal of registration of a trademark

OR

18. Discuss the powers and functions of Registrar of Trademarks.
19. 'A' is registered proprietor of trademark 'M–SEAL'. 'B' adapted and used mark 'SM-SEAL' with all essential characters of trademark 'M-SEAL'. Can 'B' be restrained from using the Mark ? Decide.

OR

20. Registrable and non-registrable marks

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
INTELLECTUAL PROPERTY RIGHTS (R13)
MODEL PAPER – II
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1. **Discuss** the protection time period for utility and plant patents?
2. **Explain** the additional period of protection with trademark renewal?
3. **Explain** the procedure for evaluating Trademark?
4. **Discuss** the conflicts of trademarks?
5. **Describe** the procedure restoration of Copyright is done?
6. **Write** surplusage in Copyright Notice?
7. **Discuss** about false advertising?
8. **What** is Right of Publicity?
9. **Discuss** about patent cooperation treaty?
10. **Explain** the patent law treaty?

PART B **Max Marks: 50**

i. Answer only one question among the two questions in choice.
ii. Each question answer (irrespective of the bits) carries 10M.

11. **Discuss** whether the following items would be protectable as trademarks, copyrights, patents, or trade secrets:

a) 'Freeze You' as the name of a new type of ice cream
b) a company's plans for its future business operations and possible mergers
c) a new type of rose
d) a new slogan to be used by Burger King

OR

12. **Explain** about patent? **Explain** about different types of Intellectual property??

13. **Discuss** about the methods of preparing the Trademark application?

OR

14. **Explain** Infringement of Trademarks? **Explain** about Inter partes and inter partes proceedings? What is the role of Inter partes?
15. **Explain** the process of the Patent Application?

OR

16. Write about the need of patent searching? Explain?

17. Write about the need of patent searching? Explain?

OR

18. Describe the determination of trade secret status?

19. Discuss about intellectual property audits?

OR

20. Discuss about international developments in trade secrets law?

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
INTELLECTUAL PROPERTY RIGHTS (R13)
MODEL PAPER – III
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1. What is intellectual property?
2. Explain the various kinds of intellectual properties
3. Explain the various kinds of intellectual properties laws relating to those properties in India.
4. 'One of the grounds for rejecting an application for registration of trademark is the lack of distinctiveness'. Explain
5. What are the essential features of trade mark?
6. **Write** surplusage in Copyright Notice?
7. **Discuss** about false advertising?
8. **What** is Right of Publicity?
9. **Discuss** about patent cooperation treaty?
10. **Explain** the patent law treaty?

PART B **Max Marks: 50**

iii. Answer only one question among the two questions in choice.
iv. Each question answer (irrespective of the bits) carries 10M.

11. **Discuss** whether the following items would be protectable as trademarks, copyrights, patents, or trade secrets:
    a) 'Freeze You' as the name of a new type of ice cream
    b) a company's plans for its future business operations and possible mergers
    c) a new type of rose
    d) a new slogan to be used by Burger King

OR

12. **Explain** about patent? **Explain** about different types of Intellectual property??
13. **Discuss** about the methods of preparing the Trademark application?

OR

14. **Explain** Infringement of Trademarks? **Explain** about Inter partes and inter partes proceedings? What is the role of Inter partes?
15. **Explain** the process of the Patent Application?

OR

16. M and N filed for patent application with provisional specification on the same date for the same invention. After that 'M' filed complete specification much earlier to 'N' but both filed within time allowed. Examine the status of patent application filed by both 'M' and 'N'.
17. State and explain the development of laws on Intellectual property and the benefits on such protection.

OR

18. What is 'mark' ? What are the various steps for registration of Trademark ?
19. What do you mean by infringement of Trademark and discuss the remedies available for infringement.

OR

20. Can the inventor of new process of bypass surgery claim a patent for new surgical method, invented by him ?

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
INTELLECTUAL PROPERTY RIGHTS (R13)
MODEL PAPER – IV
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1. **Explain** the time validity for registered trademark?
2. **Explain** united states trademark law from which time trademark is considered?
3. **Write** the scope for searching the state trademark?
4. **Write** about Indian Trade mark law?
5. **Define** the rights of ownership issues?
6. **Write** about the procedure for 'the notice of the copy right' is prepared?
7. **Write** about misappropriation under unfair competition?
8. **Write** about two unfair competitions?
9. **Discuss** why the trade secrets law is developed internationally?
10. **Write** the advantages about trade secrets law?

PART B **Max Marks: 50**

v. Answer only one question among the two questions in choice.
vi. Each question answer (irrespective of the bits) carries 10M.

11. **Explain** the functions of INTA, WIPO?

Or

12. **Describe** why Trade Secrets are necessary? How do they function?
13. **Discuss** about the advantages of Trademark use and compliance policies?

Or

14. **Explain** the Post registration procedures?
15. **Discuss** about new developments in copyright law? What are they?

Or

16. **Differentiate** Contributory Infringement and Vicarious Infringement?
17. **Discuss** about trade secret litigation?

Or

18. **Explain** about the remedies for misappropriation in Trade Secrets?
19. **Discuss** about European patent organization and what are its duties?

Or

20. **Discuss** about patent cooperation treaty?

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
III B.TECH I SEMESTER – AERONAUTICAL ENGINEERING
INTELLECTUAL PROPERTY RIGHTS (R13)
MODEL PAPER – V
MAXIMUM MARKS: 75

PART A **Max Marks: 25**

i. All questions in this section are compulsory
ii. Answer in TWO to FOUR sentences.

1. Explain how long will the copy right last if a novel written by Moby Dick in 1851 and died in 1891?
2. Describe how long will patent protections for the invention for which application was filed on August 10 and patent was issued on January 28, 2003 last?.
3. Explain the origin function of trademark?
4. Explain the trademark rights arise in law of United states?
5. Determine the affect for misappropriations of trade secrets?
6. Write the procedure to be followed for protection for submission?
7. Explain how the International patent protection act is used?
8. Discuss about International Patent protection?
9. Explain defences to Trade Secret Misappropriation? Give to remedies for Misappropriation?
10. Define trade secret protection programs?

PART B **Max Marks: 50**

vii. Answer only one question among the two questions in choice.
viii. Each question answer (irrespective of the bits) carries 10M.

11. Distinguish between Trademark and Trade secrets?

Or

12. Explain why agencies responsible for Intellectual Property Registration with any two examples?
13. Discuss new developments in Trademark Law? How do you avoid cyberspace trademark issues?

Or

14. Explain how do you select and evaluate Trademark?
15. Discuss about "the rights to perform the work publicly" and explain it?

Or

16. Explain when the terminations of transfers of copyrights take place?
17. Explain about unfair competition? Write its types?

Or

18. Discuss right of publicity? Explain?
19. Explain copyright in the electronic age?

Or

20. Explain the new developments in copyright and recent developments in copyright law?