



B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Sixth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U15EEPE17: CAD for Electrical Machines

COURSE OUTCOMES

CO1: Acquire the knowledge on fundamental of CAD design.

CO2: Understand the various design concepts of electrical machines.

CO3: Apply the finite element analysis for machine design.

CO4: Understand the elements of CAD packages and tools.

CO5: Apply the fundamental tools for CAD drawing.

CO6: Summarize and evaluate conventional and computerized design techniques.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match List-I and List- II with multiple choice code given below

CO1 [K₁]

List I	List II
A. Mass property analysis	i. Status and performance of the system
B. Discrete-event simulation	ii. Reduce the risk of construction changes
C. Finite element analysis	iii. Stress- strain, heat transfer, electric and magnetic field
D. Interference analysis	iv. Surface area, Volume and center of gravity

- | | A | B | C | D |
|----|-----|----|-----|----|
| a) | iv | i | iii | ii |
| b) | iii | iv | ii | i |
| c) | ii | iv | iii | i |
| d) | iii | i | ii | iv |

2. Which modelling technique helps to use CAD data for creating a mathematical description of the geometry of an object? CO1 [K₁]

- | | |
|--------------------------|---------------------|
| a) Geometric modelling | b) Data modelling |
| c) Dimensional modelling | d) Object-modelling |

3. Select the factors in which postprocessors are highly helpful to reduce the time involved in CO4 [K₁]
1. Input of data
 2. Analysis of the simulated results
 3. Mesh generation
 4. Creation of sub matrices and vectors
- a) 1,3 b) 1,4
c) 1,2 d) 2,3
4. Identify the function key used to quickly toggle between Object Snap ON and OFF is CO5 [K₃]
- a) F2 b) F3
c) F8 d) F5
5. Assertion (A): Normally best objective for optimal design of the machine is the lowest cost. CO2 [K₁]
Reason (R): We look at more practically feasible objective from designer point of view which is nothing but minimum Kg/KVA. It means that we are able to get output of rated KVA with minimum amount of material.
- a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false d) A is false but R is true
6. How many vertices and edges are there in hexahedron? CO3 [K₂]
- a) 8 vertices, 12 edges b) 6 vertices, 12 edges
c) 6 vertices, 9 edges d) 4 vertices, 8 edges
7. Organize the steps involved in operation of linear static problem solver CO4 [K₃]
1. Solution of the linear system of equations
 2. Assembly of these elementary matrices and vectors
 3. Creation of sub-matrices and sub-vectors corresponding to each individual finite element
 4. To build the system matrix and right hand vector
- a) 2-3-4-1 b) 3-2-4-1
c) 3-4-2-1 d) 4-1-3-2
8. Which type of meshing is considered when accuracy is of highest concern? CO3 [K₂]
- a) Pyramid mesh b) Tetrahedron mesh
c) Hexahedral mesh d) Triangular prism mesh

9. Assertion (A): The traditional methods have the advantage, from the design engineer's viewpoint, of being relatively easy, and fast to apply. CO6 [K₁]
Reason (R): Traditional design methods lie in their inability to accommodate new situations like restriction in analyzing new magnetic materials and new possibilities.
- a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false d) A is false but R is true
10. Select the command which is used to automatically calculates and display various properties of a solid in text window. CO5 [K₃]
- a) MASSPROP b) LEADER
c) DIMBASELINE d) DIMSTYLE

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Compare the capabilities of designers and computers. CO6 [K₂]
12. List the Shigley's process involved in conventional design. CO1 [K₁]
13. What are the advantages of finite element analysis? CO3 [K₁]
14. Outline the shape of tetrahedron and label its vertices, edges and faces. CO4 [K₂]
15. Give in own words about the familiar aspects a designer should know before designing a machine. CO2 [K₂]
16. List out the capabilities of AutoCAD. CO5 [K₁]
17. What are the factors that decide the quality of meshing? CO4 [K₁]
18. How do you communicate with AutoCAD? CO5 [K₁]
19. Identify the various cost parameters associated in designing an electrical machine. CO2 [K₂]
20. What is the use of data entry module in CAD based FEM? CO4 [K₁]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

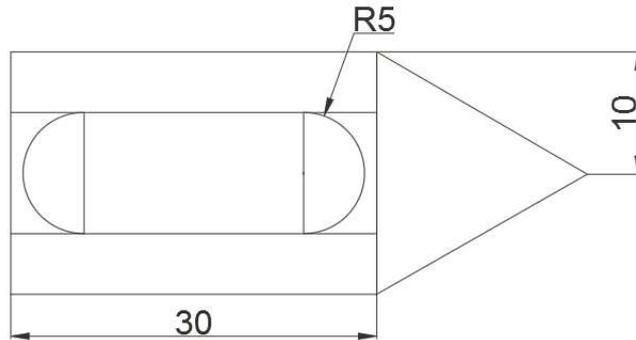
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. Explain the process involved in conventional design method with a flowchart. CO6 [K₂]

22. a) Determine the area for the given object.

(5) CO2 [K₂]



[Assume the unit are in centimeters]

b) Explain the process involved in computer aided design.

(9) CO1 [K₂]

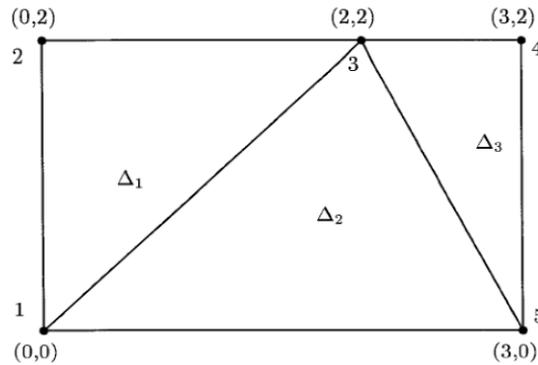
23. Construct stiffness matrix for the given object.

CO3 [K₃]

Element 1 is magnetic steel with relative permeability $\mu_r = 1000$.

Element 2 is air ($\mu_r = 1$) and

Element 3 is a conductor ($\mu_r = 1.0$) with a uniform current source. $J_o = 1500 \text{ A/m}^2$



24. Classify in detail about shapes and grids involved in meshing with relevant diagram.

CO3 [K₁]

25. Explain about the general architecture of CAD system based on finite element method.

CO4 [K₂]

26. Discuss about various command available in AutoCAD with its description.

CO5 [K₂]

27. Develop a flowchart for computer aided optimal design of three phase induction motor.

CO2 [K₃]
