**Code No: 13ME1002**
ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Regular Examinations, February-2015
CLASSICAL MECHANICS
Mechanical Engineering
(Transitory Regulation)

Time: 3 Hours   **Max Marks: 70**

PART – A
Answer all questions   **[10X1=10M]**

1. a) Explain the terms rectilinear translation, curvilinear translation and Rotation.
   b) What are the different types of loads and boundary conditions
   c) Explain the principal of Varignon's theorem
   d) Define couple and moment
   e) State laws of friction
   f) Define virtual work and work
   g) Write the equilibrium equations for 2D Rigid bodies
   h) Differentiate between polar moment of Inertia and rectangular Moment of Inertia
   i) Explain work, energy principle in curvilinear motion.
   j) Impact

PART – B
Answer one question from each unit   **[5X12=60M]**
UNIT – I
2. a) Explain what do you understand by a free body diagram and what are the principles for drawing a free body diagram.
   b) Two identical rollers weighing 80 N each and of diameter 300 mm are dropped into a smooth valley as shown in Fig. 1. Determine the reactions developed at various points of contact. Draw the free body diagrams for each body.

Fig. 1
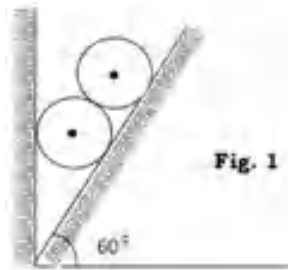
3. a) Four forces of 20,60,20 and 60 kN are acting along the sides DC, BC, BA and DA respectively of a square ABCD of side 20 cm. Find the resultant couple.
   b) Four forces act at a point as detailed below:
          i. A force of 1600 N in a direction due East,
          ii. 2000 N due North,
          iii. 3000 N in a direction North – West and
          iv. 1200 N in the direction 30^0 South of West.
   Find the magnitude and direction of their resultant.

4.　a) Define assumptions required for forces in members and perfect truss.

　　b) Determine the magnitude and nature of forces in all members of a cantilever truss as shown in Fig.2

(OR)

5.　a) Discuss with an example about principal of Virtual work to solve an equilibrium of Ideal Systems.

　　b) Using virtual work principle find the reactions at A, B and C of the beam shown in Fig.3

6.　a) Define Centroid and Centre of Gravity. Also discuss with an example about Pappus theorems.

　　b) Find the moment of inertia of the shaded area with respect to the centroidal axis parallel to AB. Shown in Fig. 4.

Fig. 4

7.　a) Using the analytical method, determine the center of gravity of the plane uniform lamina shown in Fig.5. State and prove parallel axis theorem and perpendicular axis theorem for moment of inertia of a plane lamina with an example.

Fig.5 Composite Section

2 – 3

Unit –IV

8. a) A bullet of weight 0.3N is fired horizontally into a body of weight 100N which is suspended by a string 0.8 m long. Due to this impact the body swings through an angle of 30° Find the velocity of the bullet and loss in the energy of the system.

   b) Explain the kinematics of curvilinear motion of a particle.

   c) The plane curvilinear motion of a particle is defined in polar coordinates by

   $r = \dfrac{t^3}{3} + 2t$ and $= 0.3t^2$

   Where r; and t are measured in meters; radians and seconds respectively. Find the magnitudes of velocity; acceleration and radius of curvature of the path when t = 1 sec.

OR

9. a) Explain Newton's Law principle in analysis of rigid body in translation with examples.

   b) Three weights of 150N, 60 N and 40 N are connected to the two ends of an inextensible string passing over the smooth friction pulley as shown in fig.6. Assuming weightless pulleys and strings and ideal conditions, determine the acceleration and tension in each string.

A

150 N

B

40 N

Fig.6

60 N
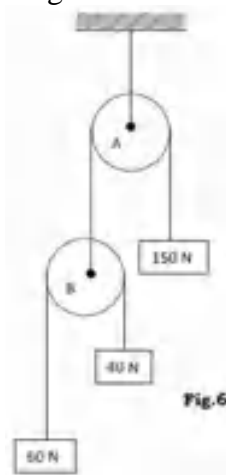
10. a) A solid circular cylinder and a sphere are started from rest at the top of an inclined plane at the same time, both roll without sliding down the plane. If when the sphere reaches the bottom of the incline, the cylinder is 24 m behind it, what is the total length of the incline.

    b) A car body of weight 4500 N has four solid disk wheels each of weight 1000 N and rolls along a horizontal plane with constant speed of 10 m/sec. Calculate the total kinetic energy of the system if the wheels roll without slipping.

OR

11 a) Explain the principle of work energy for a rigid body and also discuss about D' Alemberts Principal.

   b) A projectile is fired at a speed of 800 m/sec at an angle of elevation of 500 from the horizontal. Neglecting the resistance of air, calculate the distance of the point along the inclined surface at which the projectile will strike the inclined surface which makes an angle of 15^0 with the horizontal.

Code No: 13CS1002
ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech. I Semester Regular Examinations, February-2015
DATA STRUCTURES
(Re admitted for IT Branch only)

Time: 3 hours　　　　　　　　　　　　　　　　　　　　　　Max.Marks:70

PART –A

Answer All Questions　　　　　　　　　　　　　　　　　　**[10X1 =10M]**

1.　a. Define Recursion.
　　b. What is Non Linear Data Structure? Give an Example.
　　c. What are the merits and demerits of linked lists?
　　d. Define Linear Search.
　　e. What is the average Time Complexity of Merge Sort?
　　f. What are balanced Binary Trees.
　　g. Define adjacency matrix.
　　h. Define BFS.
　　i. Define Minimum Spanning Tree.
　　j. Define Doubly Linked List.

PART – B

Answer One Question from Each Unit　　　　　　　　　　**[5X12 =60M]**
UNIT -I
2.　What is an Algorithm? How can you analyse an Algorithm and its Complexity.
　　Explain with an example.　　　　　　　　　　　　　　　　12M
(OR)
3.　What is Recursion? Explain Linear and Binary Recursion with examples.　12M

UNIT – II
4.　Define Queue. Explain the operations performed on Queues.　　　　12M
(OR)
5.　What are different linked lists? Explain various operations performed on Lists.　12M

UNIT – III
6.　a. Write Algorithm for Merge Sort and Explain with an Example.　　　8M
　　b) Derive the Time Complexity for Merge Sort.　　　　　　　　4M
(OR)
7.　a. Write Algorithm for Binary Search and Explain with an Example.　　6M
　　b. Explain Selection Sort with an example.　　　　　　　　　6M

UNIT – IV

8. a. What is Binary Tree? Explain the operations performed on binary tree. 6M

   b. Explain In-Order, Pre – Order and Post – Order Tree Traversals by taking an example. 6M

(OR)

9. Explain the operations performed on Binary Search Tree. 12M

UNIT – V

10. a. Write short notes on adjacency matrices and adjacency lists. 6M

    b. Write BFS Algorithm with example. 6M

(OR)

11. Explain Kruskal's Algorithm for finding minimum cost spanning tree. 12M

2 – 2