AR13 **Set-01**

Code No: 13ME1002

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Regular Examinations, August – 2014
CLASSICAL MECHANICS
(Mechanical Engineering)

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

PART – A

Answer all questions **[10X1=10M]**

1.
   a) What are the various characteristics of a force
   b) State the principle of moments.
   c) How will you resolve a given force into a force and couple?
   d) What are the methods to find the axial forces in trusses?
   e) What are the forces which will have no work?
   f) State the Pappus – Guldinus theorems. Also mention their uses.
   g) Differentiate between inertia and moment of inertia
   h) A train P moves at a speed of 50 kmph in the opposite direction to that of a train Q which is moving at a speed of 70 kmph. The relative velocity of the train Q is_____
   i) State D'Alembert's principle.
   j) Define centre of gravity.

PART – B

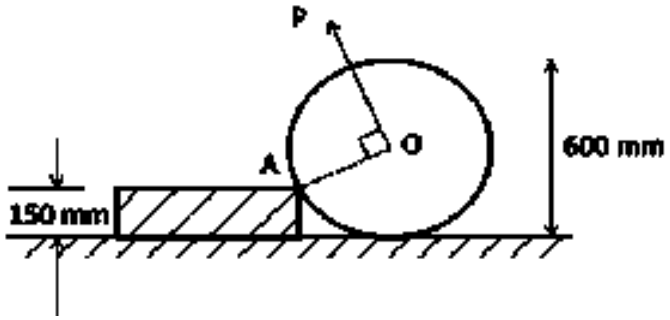
Answer one question from each unit **[5X12=60M]**

UNIT – I

2. a) Explain clearly what are the methods for finding out the resultant of force for a given system of forces. (4M)
   b) The following forces act at a point:
   (i) 20 N inclined at 30^o towards the North of East,
   (ii) 25 N towards North,
   (ii) 30 N towards North West, and
   (iv) 35 N inclined at 40^o towards South of West.
   Find the magnitude and direction of the resultant force. (8M)

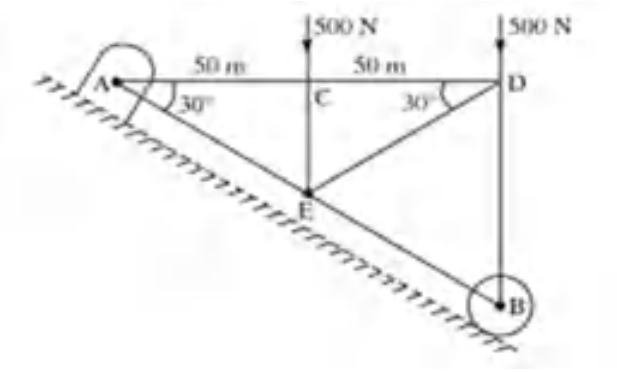
(OR)

3. a) State and prove Varignon's theorem. (4M)
   b) A uniform wheel of 600 mm diameter, weighing 5 KN rests against a rigid rectangular block of 150 mm height as shown in figure. Find the least pull, through the centre of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction of the block. (8M)



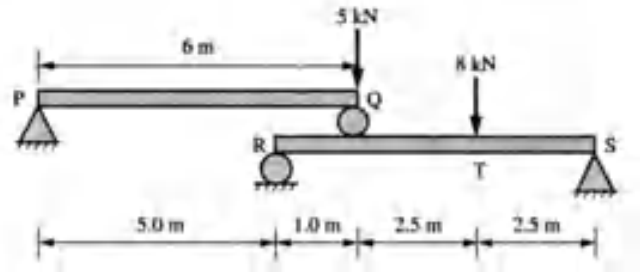
UNIT – II

4. Obtain the reactions at the hinge support A and the roller support B with the magnitudes and nature of the forces in the various members of the truss given in the figure. (12M)



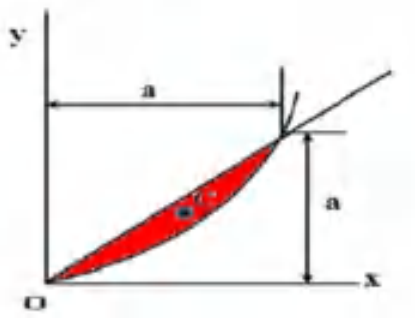
(OR)

5. Two beams PQ and RS are supported on rollers at Q and R as shown in figure. Determine the reactions at the rollers Q and R using the method of virtual work. (12M)



UNIT – III

6. Determine the coordinates x_c and y_c of the centroid for the given area between the parabola $y = x^2/a$ and the straight line $y = x$ (12M)



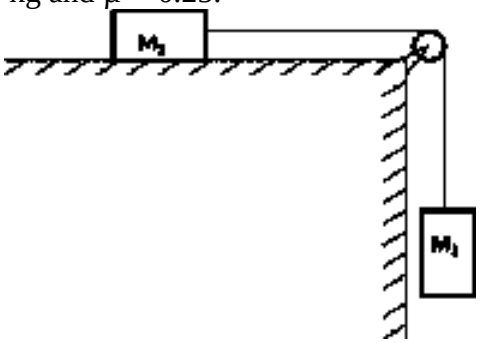
(OR)

7. a) Find the moment of inertia of a rectangle having dimensions a and b with respect to a diagonal. (6M)

   b) A grinding stone of a mosaic polishing machine has 600 mm diameter and 10 mm thick. The stone weighs 2650 kg/m^3. Determine the mass moment of inertia of the stone about its axis of rotation. Also find its radius of gyration. (6M)

UNIT – IV

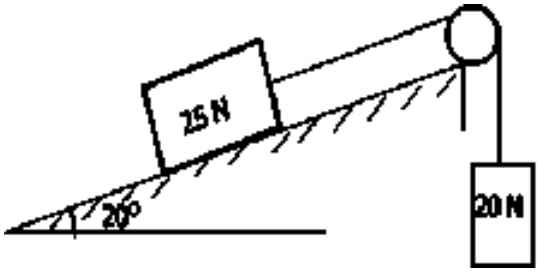
8. Two blocks of masses M_1 and M_2 are connected by a flexible but inextensible string as shown in figure. Assuming the coefficient of friction between the block M_1 and the horizontal surface to the μ find the acceleration of the masses and tension in the string. Assume M_1 = 10 kg and M_2 = 5 kg and μ = 0.25. (12M)



(OR)

9. a) The motorist is travelling on a horizontal curve of a highway of radius 200 m at a speed of 70 kmph. The brakes are suddenly applied, causing the speed decrease at a rate of 2 m/sec^2. Compute the acceleration of the motor (i) immediately after brakes have been applied (ii) 3 sec later. (6M)

   b) Two bodies weighing 25N and 20 N are connected to the ends of an inextensible string, which passes over a smooth pulley. The weight 25 N is placed on a 20^o inclined plane while the weight 20 N is hanging over the pulley. Determine (i) Acceleration of the system when 25 N moves up (ii) Tension in the string. (6M)



UNIT – V

10. a) Determine the minimum initial velocity with which a projectile may be fired so that it clears a wall 4 m high and falls on the side of the wall at a distance of 4 m.The wall is at a distance of 6 m from the point of projection. (6M)

    b) A bullet of mass 20 g moving with a velocity of 100 m/sec hits a 2 kg bob of a simple pendulum horizontally. Determine the maximum angle through which the pendulum string 0.5 m long may swing if (i) the bullet gets embedded in the bob (ii) the bullet escapes from the other end at 20 m/sec (iii) the bullet is rebounded from the surface of the bob at 20 m/sec. (6M)

(OR)

11. a) A body of mass 2 kg is thrown vertically upwards with an initial velocity of 9.8 m/sec. Find its kinetic energy (i) at the moment of its propulsion (ii) after half a second and (iii) after one second. (6M)

    b) A flywheel is made up of steel ring 40 mm thick and 200 mm wide plate with mean diameter of 2 meters. If initially the flywheel is rotating at 300 rpm, find the time taken by the wheel in coming to rest due to frictional couple of 100 N-m. Take mass density of the steel as 7900 kg/m^3. Neglect the effect of the spokes. (6M)

AR13 SET-02

CODE: 13BS1004

ADITYA INSITIUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Regular examinations, August-2014
Engineering Physics
(Common to EEE & ECE)

Time:3 hours **Max Marks:70**

PART-A

Answer all questions **[10X1=10]**

1. a).How much path difference is introduced if a ray is reflected on the surface of a denser medium?
   b). what should be the distance of separation between source and screen in fraunhofer diffraction?
   c). Define metastable state?
   d).what are the conditions for total internal reflection to take place.
   e). what is the coordination number of FCC structure per plane?
   f). Sketch [112] plane in a cube.
   g). on what basis soft and hard magnetic materials classified?
   h). Define dielectric constant.
   i). What is normalization of a wave function
   j). Mention any two assumptions of classical free electron theory.

PART-B

Answer one question from each unit **[5X12=60M]**

Unit-I

2. a) With necessary theory explain the experimental procedure to determine the wavelength of the light using Newton's rings.
   b). Distance between the slits is 0.1 mm and the width of fringes formed on the screen is 5 mm. What would be the wavelength of light used, if the distance between the screen and the slit is one meter? [8M +4M]

(OR)

3. a) What are the types of diffractions and give the differences between them.
   b) Discuss Fraunhofer single slit diffraction. Draw intensity distribution curves and give conditions for bright and dark fringes in single slit diffraction pattern [4M+8M]

Unit-II

4. a) Explain the characteristics of Lasers.
   b) With the help of suitable diagrams, explain the principle, construction and working of a He-Ne laser. [4M +8M]

(OR)

5. a) Derive expression for Numerical aperture of an optical fibre.
   b) Calculate the angle of acceptance of a given optical fibre, if the refraction indices of the core and the cladding are 1.563 and 1.498 respectively. [8M +4M]

Unit-III

6. a) Define Packing Fraction and Coordination Number.
   b) Describe seven crystal systems with diagrams. [4M+8M]

(OR)

7 .a) State and prove Bragg's law of X-ray diffraction?
   b) What are Miller indices? How can they be obtained?
[6M +6M]

Unit-IV

8. a) what is ferromagnetism? Explain the Hysteresis curve in magnetism on the basis of domains.
   b) Distinguish between Soft and Hard magnetic materials. [8M+4M]

(OR)

9. a) Distinguish between electronic, ionic and orientation polarization
   b) Obtain relation between relative permittivity and susceptibility [6M+6M]

Unit-V

10. a) Explain the terms 'Mean free path', 'Relaxation time' and 'Drift velocity' of an electron in a metal.
   b) Obtain the expression for electrical conductivity of a metal on the basis of classical free electron theory. [3M+9M]

(OR)

11. a) Derive the time independent Schrodinger's equation for a free particle..
   b) Explain the Physical significance of wave function. [8M+4M]

AR13 **Set-01**

Code: 13ME1003

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Regular Examinations, August 2014
ENGINEERING MECHANICS
(Common to CE, CSE & IT)

Time: 3 hours **Max Marks: 70**

PART – A

1. Answer all Questions **[10 X 1 = 10M]**

a) What are the equilibrium conditions for the concurrent coplanar system?
b) State parallel axis theorem?
c) State varignon theorem
d) Define couple?
e) Define Angle of Repose?
f) Write the relation between area moment of inertia and mass moment of inertia?
g) What is Radius of gyration?
h) Define curvilinear motion?
i) Define Kinetics
j) Define centre of gravity?

PART-B

Answer one question from each unit **[5X 12 = 60M]**

UNIT-I

2. Explain in detail about the System of forces with neat sketches?

(OR)

3. a) State and prove parallelogram Law
b) Discuss graphical and analytical methods for finding resultant of several coplanar concurrent forces?

UNIT-II

4. Two rollers of weights P and Q are connected by a flexible inextensible string AB. The rollers rest on two mutually perpendicular planes DE and EF as Shown. Find the tension in the string and the angle θ that it makes with horizontal when the system is in equilibrium. The following numerical data are given *P=267N, Q = 445N, α = 30^0*.

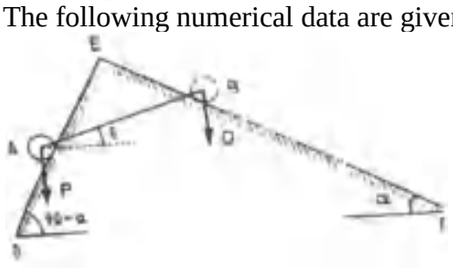


Fig. for Problem **4**

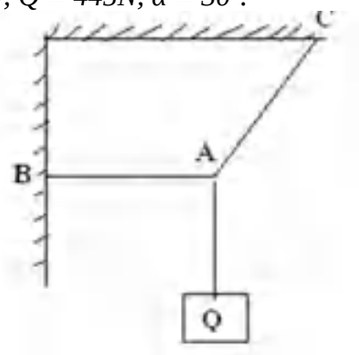


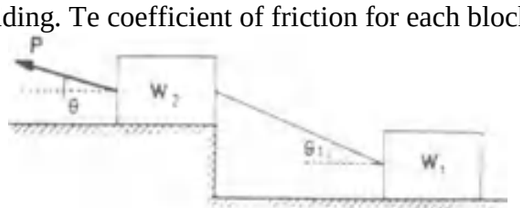
Fig. for Problem **5**

(OR)

5. Calculate the tensions S_1 and S_2 in the two strings AB and AC that support the lamp of weight Q = 178 N. Assume AC makes an angle 30^0 with horizontal.

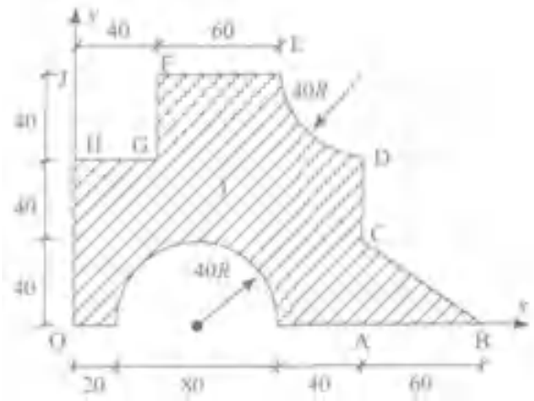
UNIT-III

6. Two blocks of weight W_1 and W_2 are connected by a string and rest on a horizontal plane as shown. Find the magnitude and direction of the least force P that should be applied to the upper block to induce sliding. Te coefficient of friction for each block is to be taken as μ



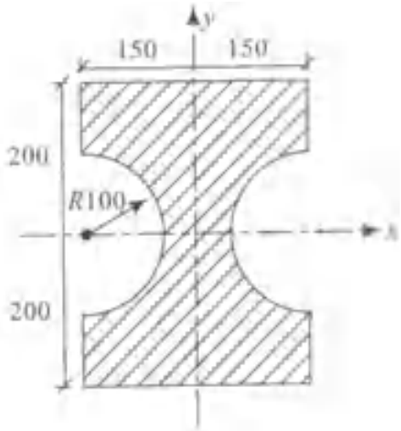
(OR)

7. Determine the centroids of the composite area as shown in Figure?



UNIT-IV

8. Find the Moment of Inertia about X and Y axes

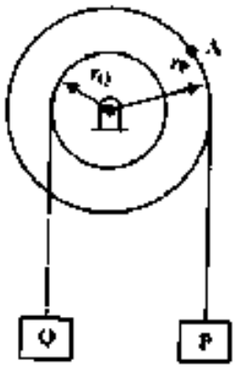


(OR)

9. Derive the mass moment of inertia of solid cone of height H and base radius R about its axis of rotation and an axis through the vertex normal to the axis of rotation.

UNIT-V

10. A pulley system attached with loads P and Q as shown in Figure. If P has uniform acceleration of 4.2 m/sec^2 with initial velocity 3 m/see downward, determine the number of revolutions executed by the pulley in 5 sec, velocity and position of the load Q after 5 sec and acceleration of the point A at t = 0. Take r_p= 2 m, r_q = 1.5 m.



(OR)

11. Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown. The coefficient of friction between the sliding surfaces of the weights and the plane is 0.3. Using D-Alembert's Principle determine the acceleration of the weight and the tension in the thread