13ME1003

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B. Tech II Semester Regular/Supplementary Examinations, May-2016
ENGINEERING MECHANICS
(Common to CE, CSE & IT)

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

PART- A

Answer all questions **[10 x 1=10M]**

1. a) Define the term resultant of a force system.
   b) State the Parallelogram law of forces.
   c) The------- is a rotational tendency of a force.
   d) When the lines of action of all the forces do not intersect at a point in the system is known as ---------- force system.
   e) What is angle of friction?
   f) Difference between centre of gravity and centre of mass .
   g) State Pappus Theorem-I.
   h) What is Polar moment of inertia?
   i) Express the acceleration of a particle in tangential and normal components.
   j) State D'Alemberts principle..

PART-B

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

UNIT-I

2. Determine the magnitude and direction of the resultant of the following set of forces acting on a body (i) 200 N inclined 30^0 with east towards north, (ii)250 N towards the north,(iii) 300 N towards northwest, and (iv)350 N inclined at 40^0 with west towards south. What will be the equilibrant of the given force system? (12M)

(OR)

3. (a) Discuss graphical and analytical methods for finding resultant of several coplanar concurrent forces. (6M)
   (b) Determine the resultant of four forces concurrent at the origin as shown in Fig.1. (6M)

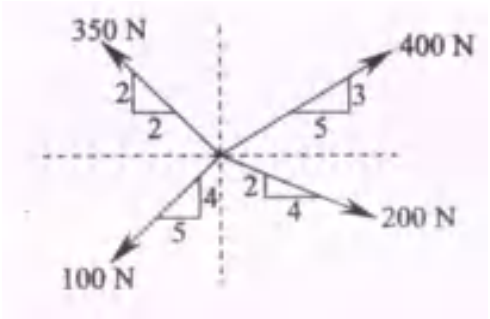

Fig.1

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UNIT-II

4. Three smooth cylinders, each of radius 'r' and weight 'w' are placed in a rectangular channel of width 5 r as shown in Fig.2.Determine the reactions at all contact surfaces. (12 M)

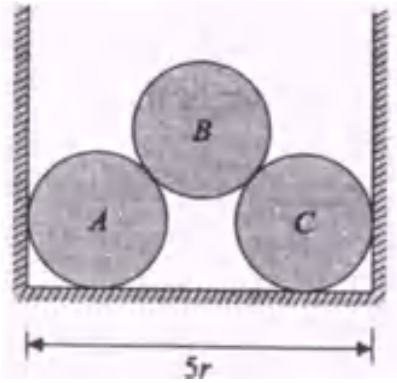

Fig.2

(**OR)**

5. An equilateral triangular plate of side 3 m is acted on by three forces as shown in Fig.3.Replace them by an equivalent force-couple system at A. (12M)

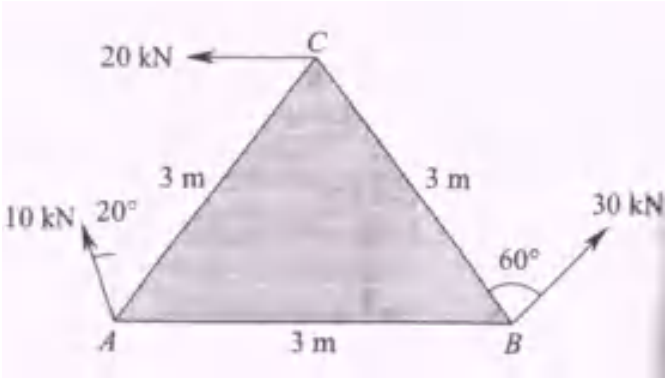

Fig.3

UNIT-III

6. Two blocks A and B are resting against a wall and the floor as shown fig. Find the value of the horizontal force P applied to the lower block that will hold the system in equilibrium. Coefficient of friction are: 0.25 at the floor, 0.3 at the wall and 0.2 between the blocks (12M)

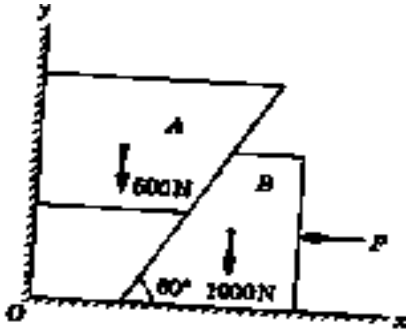

Fig.4

(OR)

7. a) Determine the centroid of the shaded area formed by removing a semicircle of diameter 'r 'from a quarter circle of radius'r'. (8M)

   b) Determine the surface area and volume of a cone using the Pappus and Guldinus Theorems. (4M)

UNIT-IV

8. Find the moments of inertia of the I-Section shown in Fig.5 about the centroidal axes. Also, find the radii of gyration about the same axes. (12M)

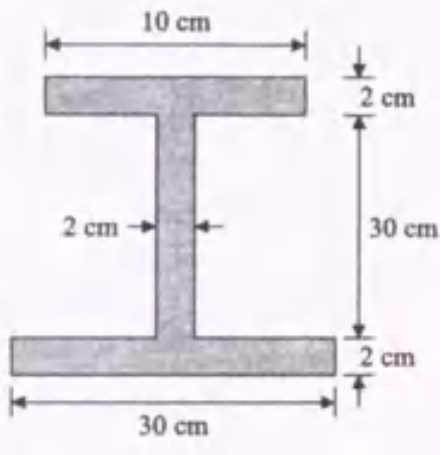

Fig.5

(**OR**)

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9. Find the moments of inertia of the cut section shown in Fig.6 about the centroidal axes, two semi circular portions are cut from a rectangular plate. (12M)

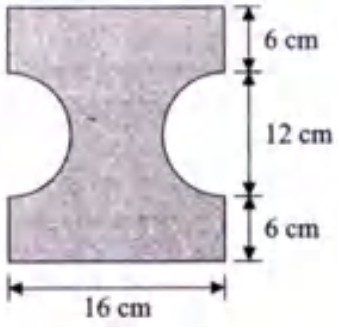

Fig.6

UNIT-V

10. a) A car covers 100 m in 10 seconds, while accelerating uniformly at a rate of 1 m/s^2.Determine (i) initial and final velocities of the car, (ii) distance travelled before coming to this point assuming it started from rest, and (iii) its velocity after the next 10 seconds. (6M)

b) The x and y coordinates of the position of a particle moving in curvilinear motion are defined by $x = 2+3\ t^2$ and $y = 3+t^3$.Determine the particle's position, velocity and acceleration at t = 3 s. (6 M)

(OR)

11.a) A pelton wheel turbine used in a lab runs at 1200 rpm, when the water jet is suddenly shut off. If it comes to rest in 30 seconds, determine the retarding torque due to friction in the bearings assuming it to be uniform. The mass of the wheel is 20 Kg and the radius of gyration is 20 cm. (6M)

b) A string is wound several times around a solid cylinder of 2 Kg mass. The free end of the string is fixed to the ceiling and the cylinder is released from rest. Determine its velocity after it has fallen through a height of 2 m. In addition, determine the tension in the string. (6M)

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13BS1004 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B. Tech II Semester Regular/Supplementary Examinations, May-2016

ENGINEERING PHYSICS

(Common to EEE & ECE)

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

PART- A

Answer all questions **[10 x 1=10M]**

1. a) Write principle of superposition?
   b) How is diffraction different from interference?
   c) Bring out the differences between the laser light and ordinary light?
   d) Explain how the optical fibers are classified?
   e) How many Lattice Points a Unit Cell of FCC Lattice contain?
   f) Sketch the following atomic planes in a simple cubic structure (010) and (110)?
   g) Define Magnetic field induction (B)?
   h) Explain Electric Dipoles in Dielectric Materials?
   i) Mention any two limitations of free electron theory?
   j) What are Matter Waves?

PART-B

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

UNIT-I

2. a) With necessary theory describe Newton's rings experiment to determine wave length of the given source.
   b) Calculate the thickness of air film at 10^{th} dark ring in a Newton's rings system viewed normally by a reflected light of wave length 500nm. The diameter of the 10^{th} dark ring is 2mm. **[8M+4M]**

(OR)

3. a) Distinguish between interference and diffraction.
   b) Discuss the Fraunhofer diffraction at a single slit. Explain how it can be used to determine the slit width. **[4M+8M]**

UNIT-II

4. a) What do you understand by population inversion? How it is achieved.
   b) Explain the construction and working of a Ruby Laser. **[4M+8M]**

(OR)

5. a) Define acceptance angle and numerical aperture and derive expressions for them.
   b) With the help of a suitable diagram explain the principle, construction and working of an optical fiber as a waveguide. **[6M+6M]**

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13BS1004 **SET-2**

UNIT-III

6. a) Explain the unit cell and lattice parameters. What is primitive cell and how does it differ from unit cell.
   b) What is space lattice? Find the packing fraction for BCC and FCC crystals. **[4M+8M]**

(OR)

7. a) Derive an expression for inter planar distance between parallel planes (h k l).
   b) What are Crystal Planes? Explain the significance of Miller indices. **[8M+4M]**

UNIT-IV

8. a) Explain the relation between Relative Permeability and Susceptibility.
   b) What is ferromagnetism? Explain the properties of ferromagnetic materials.
   c) What is Ferromagnetic Hysteresis? Explain retentivity and coercivity. **[4M+4M+4M]**

(OR)

9. a) Define dielectric constant (ε_r) and polarizability(α).
   b) Explain the Ionic Polarizability and derive an expression for the same.
   c) Enumerate the applications of piezoelectrics **[4M+4M+4M]**

UNIT-V

10. a) Derive the expression for electrical Conductivity of a metal on the basis of Classical free electron theory.
    b) Explain the terms, Mean free path and Relaxation time. **[6M+6M]**

(OR)

11. a) Find the energy levels of a particle enclosed in a one dimensional potential box of infinite height.
    b) Explain the physical significance of wave function. **[8M+4M]**

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Code: 13ME1002 SET-1

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT,TEKKALI
(AUTONOMOUS)
I B. Tech II Semester Regular/Supplementary Examinations, May-2016
CLASSICAL MECHANICS
(MECHANICAL ENGINEERING)

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

PART - A

Answer All Questions **[10 x 1=10M]**

1. a) What are concurrent forces?
   b) Define Lami's Theorem.
   c) What do you mean by Perfect Truss?
   d) What is the Principle of Virtual Work?
   e) Define Centroid.
   f) State Parallel axis theorem for area moment of Inertia.
   g) State Pappus theorem.
   h) What is the principle of Conservation of Energy?
   i) State the relation between Work and Energy.
   j) What is normal acceleration?

PART – B

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

UNIT- I

2. a) State Moment of a force and its applications? [4M]
   b) Two equal weights each of 1000N is supported by a flexible string as shown in fig1. Find the tensions in the portion AB, AC and CD of the string. [8M]

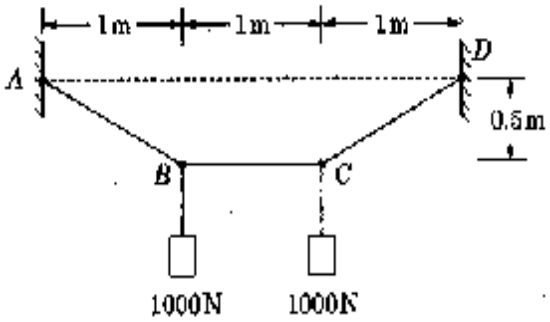

Fig.1

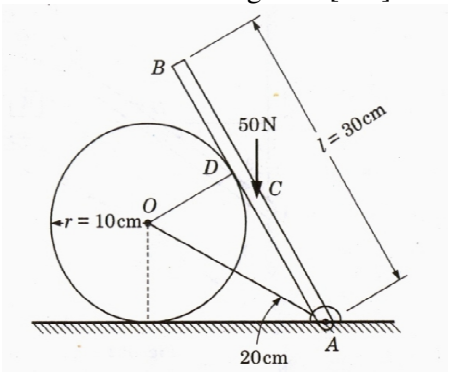

Fig.2

(OR)

3. a) Define the term "Free - body diagram". Draw the Free body diagram of a block of weight W, placed on a horizontal surface. [4M]

   b) A smooth cylinder of radius r = 10cm resting on a horizontal surface supports a bar AB of length 30cm which is hinged at A as shown fig2. The weight of the bar is 50N. The cylinder is kept from rolling away by a string AO of length 20cm. Assuming all surfaces to be frictionless, Find the tension in the string. [8M]

UNIT-II

4. a) What are the different methods for analysing the forces in a perfect Truss. What is the advantage of method of section over method of joints? [4M]

   b) A truss is loaded and supported as shown in fig 3. Determine the axial forces in the members CE, CG and FG. [8M]

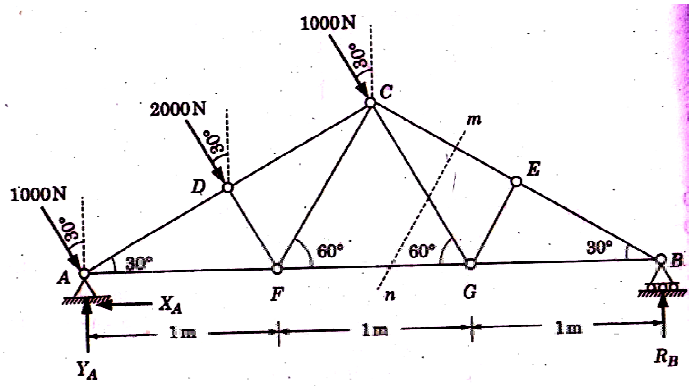

Fig.3

(OR)

5. a) State the principle of virtual work. [3M]

   b) Two uniform rods each of length l and weight W are connected as in fig 4. Using the method of virtual work determine θ_1 and θ_2 corresponding to the equilibrium of the bars. [9M]

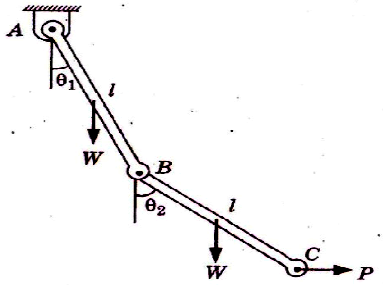

Fig.4

UNIT-III

6. a) Determine the coordinates of the centroid of the shaded area formed by the intersection of a straight line and a parabola as shown in fig5. The equation of the parabola is given by $y = x^2/a$ and of straight line by $y = x$. [6M]

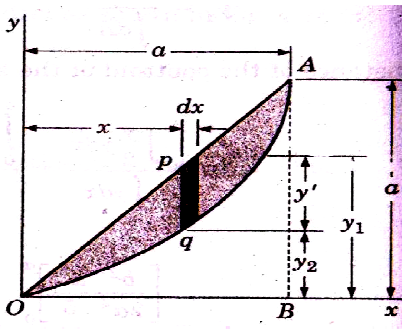

Fig.5

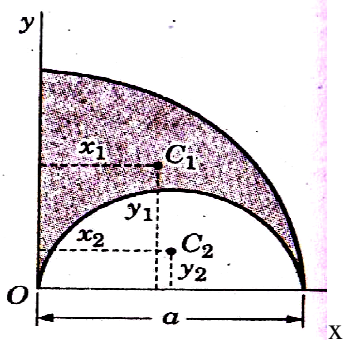

Fig.6

   b) Determine the centroid of the shaded area shown in fig 6. [6M]

(OR)

7. a) Find the moment of inertia of a plate with a circular hole (Fig.7) with respect to centroidal x-axes. [8 M]

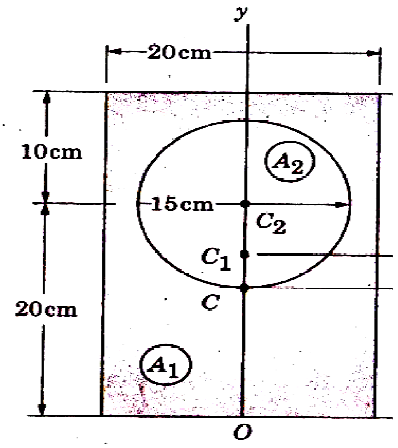

Fig.7

b) Determine the moment of inertia of a rectangle of cross section b x h about its centroidal axes. Also , find its moment of inertia about its base [4 M]

UNIT-IV

8. a) A stone is dropped from the top of a tower 60m high. At the same instant , another stone is thrown vertically upwards from the foot of tower to meet the first stone at a height of 18m. Determine (a) the time when the two stones meet, (b) the velocity with which the second stone was thrown up. [6M]

b) A train starts from rest and increases its speed from zero to 'v' m/s with a constant acceleration of a_1 m/s^2, runs at this speed for some time and finally comes to rest with a constant deceleration a_2 m/s^2. If the total distance travelled is 'x' in metres, find the total time t required for this journey. [6M]

(OR)

9. Two blocks A and B are held on an inclined plane 5 m apart as shown in the figure The coefficients of friction between the block A and B and the inclined plane are 0.2 and 0.1 respectively. If the blocks begin to slide down the plane simultaneously as in fig 8. Calculate the time and distance travelled by the each block before collision. [12M]

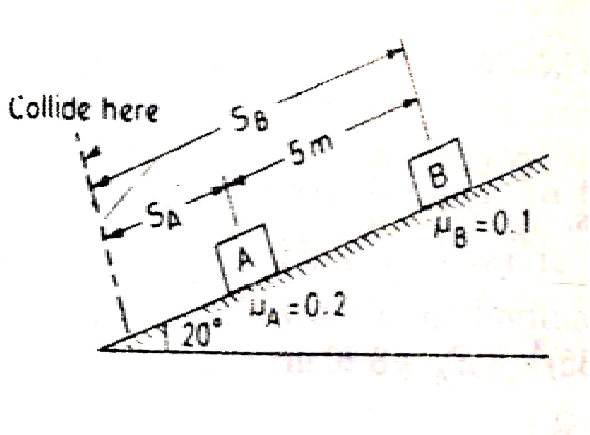

Fig.8

UNIT-V

10.

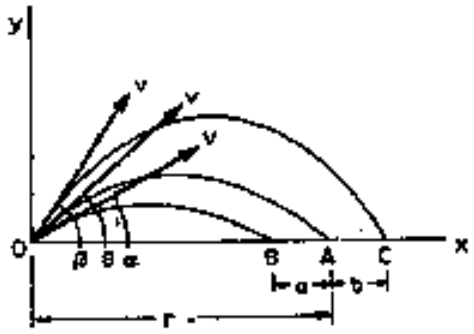

Fig.10

A projectile is aimed at a target which lies in the horizontal plane through the point of projection. It falls '*a*' metres short of the target when the angle of projection is α and goes '*b*' metres too far off when the angle of projection is β as in fig 10. Determine the angle of projection θ. If the velocity of projection is the same in all the three cases. [12 M]

(OR)

11. a) Explain the concept of plain motion of rigid body. [4 M]

b) A block of mass 5 kg resting on a 30° inclined plane is released. The block after travelling a distance of 0.5 m along the inclined plane hits a spring of stiffness 15 N/cm as in fig 11. Find the maximum compression of spring. Assume the coefficient of friction between the block and the inclined plane as 0.2. [8 M]

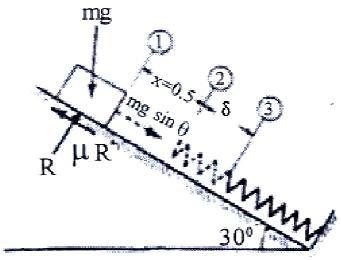

Fig.11

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