13BS1004

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)

I B. Tech II Semester Regular / Supplementary Examinations, July, 2015

ENGINEERING PHYSICS

(Common to EEE & ECE)

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

PART- A

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

1. a) What is principle of superposition of waves.
   b) Mention two differences between Fresnel and Fraunhofer diffraction.
   c) Mention four characteristics of laser beam.
   d) Define Total internal reflection of light.
   e) What is coordination number.
   f) Sketch the plane (100) of a cubic unit cell .
   g) Give the relation between B and H.
   h) What is Piezoelectricity?
   i) Define mean free path of an electron.
   j) Give the normalization of the wave function.

PART- B

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

UNIT-I

2. a) Give the conditions for constructive and destructive interferences.
   b) Explain the interference in thin film by reflection.
   c) A parallel beam of light $\lambda = 5890A^0$, is incident on a glass plate ($\mu = 1.5$) such that angle of refraction into plate is 60^0. Calculate the smallest thickness of the plate which will make it appear dark by reflection. [2M+8M+2M]

(OR)

3. a) Distinguish between Fresnel and Fraunhofer diffraction.
   b) Describe Fraunhofer Diffraction due to single slit and explain intensity distribution. [4M+8M]

UNIT-II

4. a) What are Einstein coefficients? Give the three main components of any Laser system.
   b) With suitable diagrams explain the principle, construction and working of He-Ne Laser. [4M+8M]

(OR)

5. a) Define (i) Total Internal Reflection (ii)Acceptance angle (iii) Numerical aperture
   b) How are optical fibers classified based on refractive index profile.
   c) Estimate the numerical aperture and acceptance angle of a fiber with core index of 1.54 and a cladding index of 1.50 when the fiber is inside water of refractive index 1.33 [3M+5M+4M]

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UNIT-III

6. a) Define (i) Unit Cell (ii) Space lattice
   b) What is a Bravais lattice? What are the different space lattices in cubic system? Show that the packing factor of simple cubic is 52%. [4M+8M]

(OR)

7. a) What are Miller indices? How are they obtained? Sketch the following planes of cubic unit cell: (001), (120) and (110)
   b) State and explain Braggs law. [8M+4M]

UNIT-IV

8. a) Distinguish between paramagnetic, diamagnetic and ferromagnetic materials.
   b) Explain domain theory of ferromagnetism.
   c) What is hysteresis in magnetic materials. [6M+4M+2M]

(OR)

9. a) Define and express (i) Polarization vector(P) (ii) Electric displacement vector(D)
   b) Obtain the relation between D,E and P.
   c) A parallel plate capacitor having plate separation of 2×10^{-3}m across which a potential of 10V is applied. Calculate the dielectric displacement when a material of dielectric constant 6.0 is introduced between the plates. [4M+4M+4M]

UNIT-V

10. a) What are the assumptions of classical free electron theory?
    b) Derive an expression for electrical conductivity of a material in terms of mobility of the electron using classical free electron theory [4M+8M]

(OR)

11. a) Derive the expression for de Broglie wavelength.
    b) Show that the energies of a particle in a one dimensional potential box are quantized. [4M+8M]

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13ME1002

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I B. Tech II Semester Regular / Supplementary Examinations, July, 2015
CLASSICAL MECHANICS
(Mechanical Engineering)

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

PART- A

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

1. a) State Triangle law of forces.
   b) Explain the term 'Rigid Body'.
   c) Define Moment of a Force.
   d) What is meant by a 'Strut'?
   e) Explain the term 'Virtual displacement'.
   f) What is Centre of Gravity?
   g) Define the term 'Polar Moment of Inertia'.
   h) What is meant by Instantaneous Velocity?
   i) State D Alembertes principle.
   j) Define work.

PART-B

Answer One question from each unit **[5x12=60M]**

UNIT-I

2. a) State and Prove Polygon Law of Forces.
   b) The Force system shown in the fig.2 (b) has a resultant of 200 N pointing up along Y-axis. Compute the values of F and θ required to give this resultant.

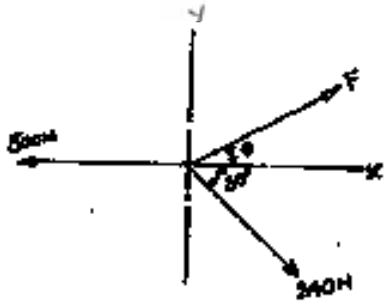

Fig.2(b)

(OR)

3. Three Cylinders are piled in a rectangular ditch as shown in fig.3 Neglecting friction determine the reaction between cylinder A and the vertical wall.

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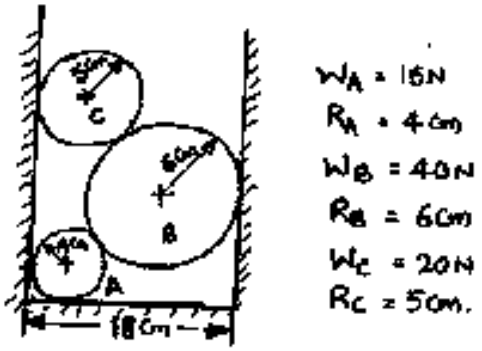

Fig.3

UNIT-II

4. Determine the forces in all the members of the truss shown in fig.4 and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m.

Fig.4

(OR)

5. a) Find the force P acting on each of the two links in horizontal direction shown in fig.5 (a) that will support the cylinder of weight W. Neglect friction and the weights of the links.

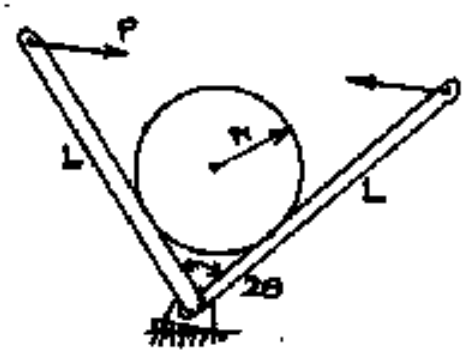

Fig.5(a)

b) Find the forces in the members CB, CD, DB and DE of the truss as shown in fig. 5(b)

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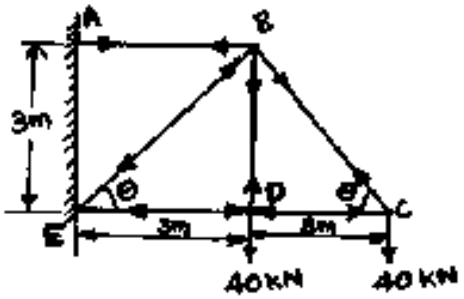

Fig.5(b)

UNIT-III

6. a) Determine the centriod of the quarter circle shown in fig. 6(a). when radius is r.

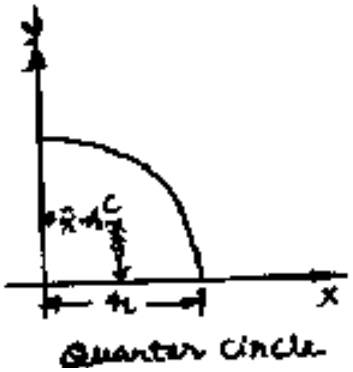

Fig.6 (a)

b) Determine the centriod of the lines that form the boundary of the shaded area in fig. 6(b)

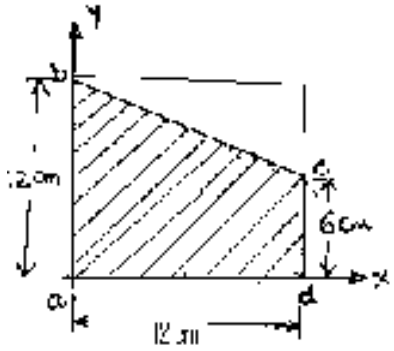

Fig.6(b)

(OR)

7. The cross section of a culvert is shown in fig.7. compute the moment of inertia about the horizontal X axis.

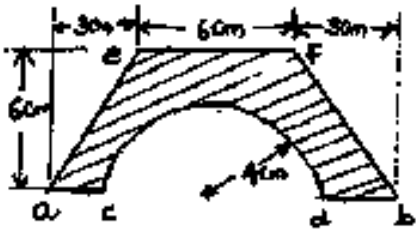

Fig.7

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UNIT-IV

8. a) A stone is dropped down in a well and 5 sec. later the sound of the splash is heard. If the velocity of sound is 330m/s. What is the depth of the well.
   b) Determine acceleration of bodies in fig.8 (b), if coefficient of kinetic friction is 0.2 at all contact surfaces. Body A weighs 200N and B weighs 300N.

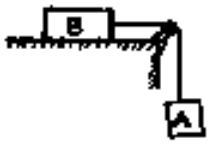

Fig.8(b)

(OR)

9. a) A particle moves on a circular path of 40 cm radius so that its arc distance from a fixed point on the path is given by $s=4t^3-10t$ where s is in meters and t is in seconds. Compute the total acceleration at the end of 2 sec.
   b) Determine the tension in the string and accelerations of blocks A and B weighing 1500N and 500N connected by an inextensible string as shown in fig. 9(b). Assume pulleys as frictionless and weightless.

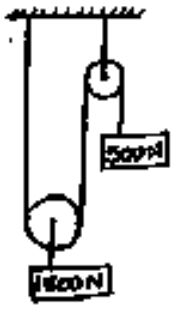

Fig.9(b)

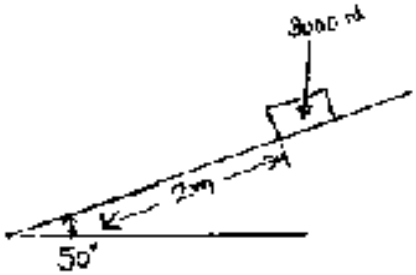

Fig.10 (b)

UNIT-V

10. a) Show that the path of projectile is parabola also derive the expressions for maximum height, horizontal range and time of flight of the projectile.
    b)A 3000N block starting from rest as shown in Fig. 10(b) slides down a 50° incline. If the coefficient of friction between the block and incline is 0.2, determine the velocity of the block after travelling a distance of 2m.

(OR)

11. The composite pulley shown in fig. 11, weighs 800N and has a radius of gyration of 0.6m. The 2000N and 4000N blocks are attached to the pulley by inextensible strings as shown in the figure. Using work energy principle, determine the resulting velocity when distance moved by 4000N block is 2m and hence determine the resulting acceleration.

Fig.11

AR 13 **SET 02**

Code : 13ME1003

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ENGINEERING MECHANICS
(Common to CE, CSE & IT)

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

PART-A

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

1. a) What do you mean by resolution of a force?
   b) How do you define moment of a force?
   c) List the characteristics of a force.
   d) What are the units of force and moment?
   e) Define Limiting friction
   f) The moment of inertiaof a circular area of diameter d is ----------
   g) What is the moment of inertia of a quarter circle about its centroidal axis
   h) Define polar moment of inertia
   i) State D'Alemberts principle
   j) What are the units of energy and work done

PART-B

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

UNIT-I

2. a) Define resultant of a force and transmissibility of a force. [4M]
   b) Four coplanar forces are acting at a point in Fig.1. Three forces have magnitude of 20, 50 and 20N at angles of 45°, 200° and 270° respectively. Fourth force is unknown. Resultant force has magnitude of 50N and acts along *x*-axis. Determine the unknown force and its direction from *x*-axis [8M]

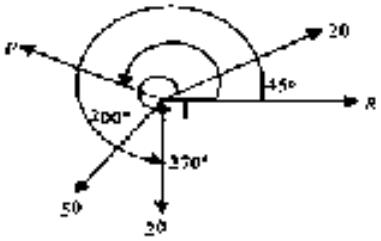

Fig.1.

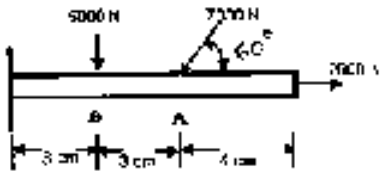

Fig. 2

(OR)

3. a) State Varignon's Theorem. [2M]
   b) Find the resultant of the force system acting on the beam shown in Fig.2. [10M]

UNIT – II

4. Two smooth circular cylinders, each of weight W = 445 N and radius r = 152 mm, resting on a horizontal plane, supporting above them a third cylinder of weight Q = 890 N and radius r = 152 mm. AB=406 mm. Find the forces in the string and the pressures produced on the floor at the points of contact D and E as shown in figure 3. [12M]

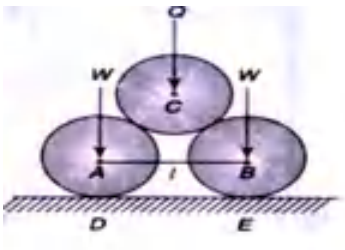

Fig 3

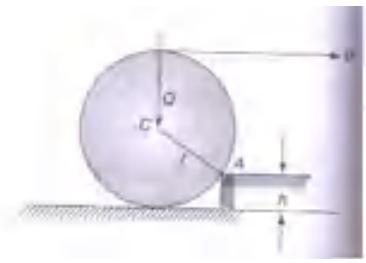

Fig 4

(OR)

5. a) What are the conditions of equilibrium of coplanar non – concurrent force system. [4M]
   b) A roller of radius r = 0.3m and weight Q = 2000N is to be pulled over a curb of height h = 0.05m by a horizontal force P applied to the end of a string wound around the circumference of the roller. Find the magnitude of P required to start the roller over the curb. (As shown in the figure 4). [8M]

UNIT – III

6. a) Write Laws of Friction. [4M]

b) Determine the necessary force P acting parallel to the plane to cause motion to impend. Assume the coefficient of frication is 0.25 and the pulley smooth Fig.5. [8M]

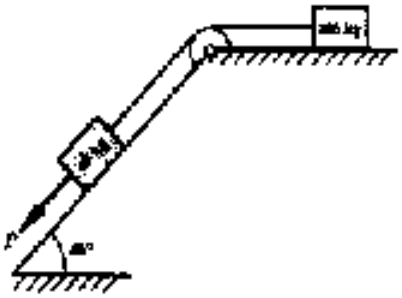

Fig 5.

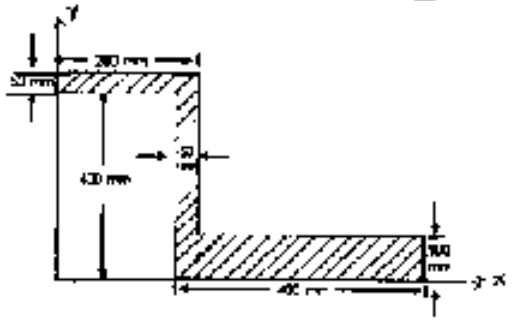

Fig.6.

(OR)

7. a) State and prove parallel axis theorem [6M]

b) Find the centroid of the 'Z' section shown in figure 6. [6M]

UNIT – IV

8. Calculate the moment of inertia of the area of the angle section about centroidal X and Y axes having the dimensions shown in fig 7. [12M]

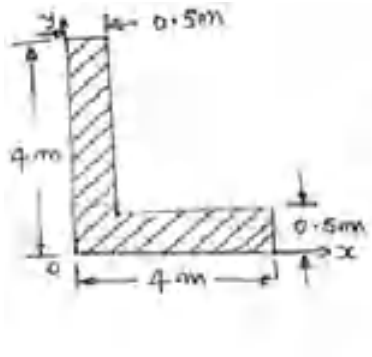

Fig 7

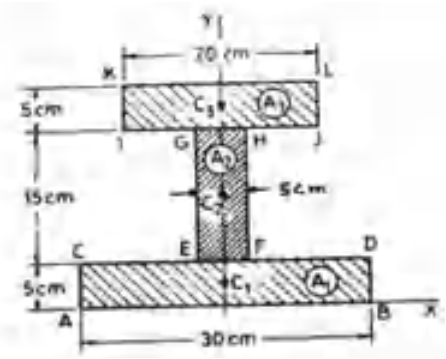

Fig.8

(OR)

9. Determine the moment of inertia of the area as shown in fig 8 about its horizontal centroidal axis [12M]

UNIT – V

10. A 500 N body moves along two inclines for which the COF is 0.3. If the body starts from rest at A and slides 60 m down the 30^0 incline, how far will it then move along the other incline? [12M]

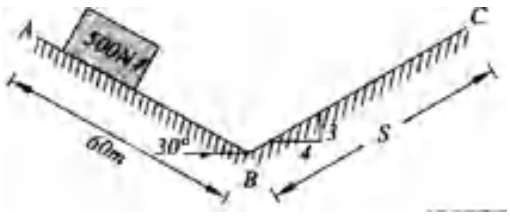

Fig 9

(OR)

11. a) Explain the concept of D' Alemberts principle. . [4M]

b) The equation of motion of a moving body along a straight line is given by $S = 15t + 3t^2 - t^3$, where S is the distance covered from the starting point in meters and t is time in seconds. Find:

a. The velocity and acceleration at start.
b. The time when the particle reaches its maximum velocity, and
c. The maximum velocity of particle. [8M]