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Code : 13ME1003

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B. Tech II Semester Supplementary Examinations, August-2015
ENGINEERING MECHANICS
(Common to CE, CSE & IT)

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

PART-A

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

1. a) State law of transmissibility of forces?
   b) What is free body diagram?
   c) Define couple.
   d) State Lami's theorem?
   e) What is coefficient of friction
   f) Maximum value of static friction is known as _____.
   g) What is the moment of inertia of a semi circle about its centroidal axis
   h) Differentiate between kinematics and kinetics.
   i) A body is projected vertically upwards with a velocity of 4m/s. at the maximum height its velocity is _____
   j) Define work done?

PART-B

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

UNIT-I

2. a) State and prove parallelogram law of forces. [4M]
   b) Five forces 2N, 4N, 5N, 6N and 3N respectively act at one of the corners of a regular hexagon towards other five corners. Find the magnitude and direction of the resultant force [8M]

(OR)

3. a) State and prove Varignon's Theorem. [4M]
   b) Two forces P and 2P act on a particle. If the first force is increased by 12N and second force is doubled, the direction of their resultant remains unchanged. Find the value of P. [8M]

UNIT – II

4. Two identical spheres are kept in a horizontal channel of width 105cm as shown in Fig1. Determine the reactions coming from all contact surfaces. Consider the radius of the sphere as 27cm and the weight 540 N. [12M]

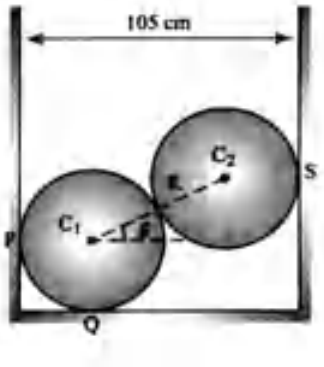

Fig 1

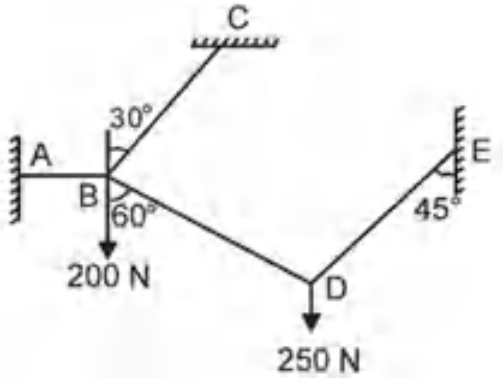

Fig 2.

(OR)

5. A system of connected flexible cables shown in Fig2. is supporting two vertical forces 200 N and 250 N at points B and D. Determine the forces in various segments of the cable. [12M]

UNIT – III

6. a). Differentiate the terms static friction and dynamic friction [2M]
   b) What is the value of P in the system shown in Fig. 3 to cause the motion to impend? Assume the pulley is smooth and coefficient of friction between the other contact surfaces is 0.2 [10M]

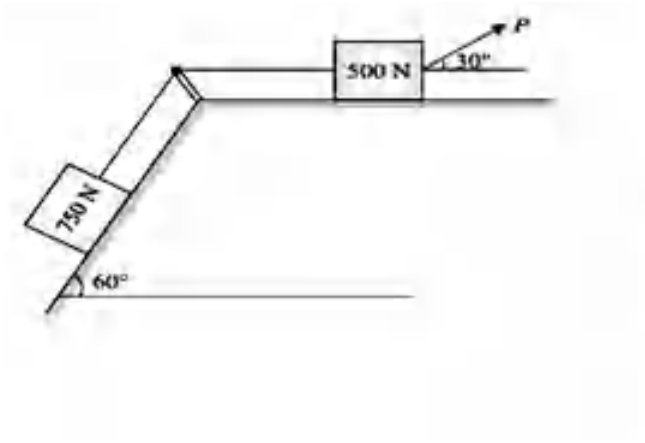

Fig 3

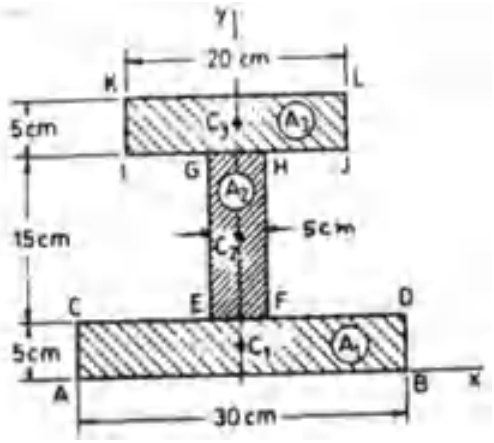

Fig.4

(OR)

7. a) State and prove perpendicular axis theorem [4M]
   b) Find the centroid of the section shown in figure 4. [8M]

UNIT – IV

8. Derive the expression for the moment of inertia of a circle with respect to a diameter. [12M]

(OR)

9. Determine the moment of inertia of the area as shown in fig 5 about its horizontal centroidal axis [12M]

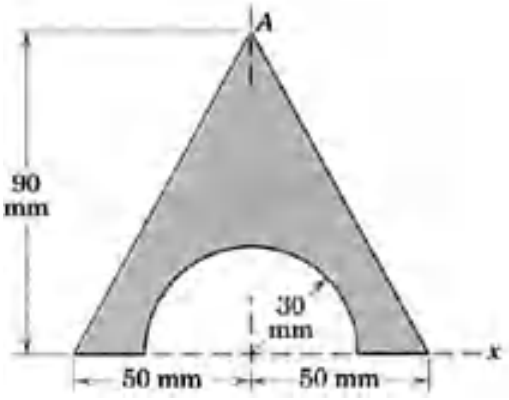

Fig.5

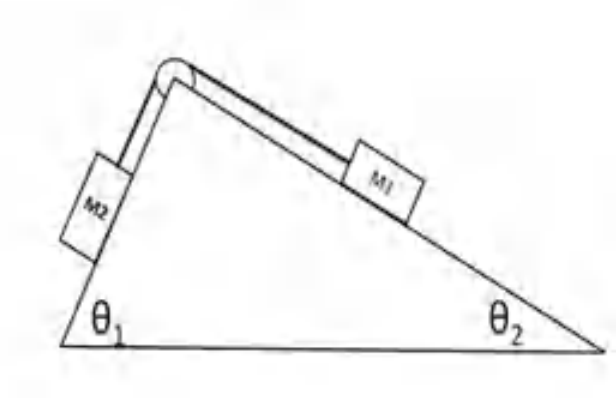

Fig. 6

UNIT – V

10. Two blocks of masses M_1 and M_2 are placed on two incline planes of elevation θ_1 and θ_2 and are connected by a string as shown in Fig 6. Find the acceleration of the masses. Given M_1=10 kg, M_2=15 kg, $\theta_1=60^0$, $\theta_2=30^0$, μ=0.25 [12M]

(OR)

11. A car starting from rest speeds up to 12 m/s with a constant acceleration 1.2 m/s^2, runs at this speed, and finally comes to rest with a deceleration of 1.5 m/s^2. If the total distance travelled is 360m, find the total time required to travel this distance. [12M]

13BS1004

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B. Tech II Semester Supplementary Examinations, August-2015

ENGINEERING PHYSICS

(Common to EEE & ECE)

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

PART- A

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

1. a) When can we observe a sustained interference pattern.
   b) In which class of diffraction lenses are used to catch the pattern.
   c) Mention three requirements of a laser system.
   d) Give the classification of optical fibers based on refractive index profile.
   e) Give the packing fraction of simple cubic structure.
   f) State Bragg's law.
   g) What is Bohr Magneton?
   h) Define polarization vector.
   i) Give two merits of classical free electron theory.
   j) What is dual nature of matter.

PART- B

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

UNIT-I

2. a) Define interference of light.
   b) Describe Young's double slit experiment to explain interference.
   c) Two sinusoidal waves of equal amplitudes are ¼ wavelengths out of phase. What is amplitude of resultant? [2M+8M+2M]

(OR)

3. a) Define diffraction of light. Explain how diffraction is different from interference.
   b) Distinguish between Fresnel and Fraunhofer diffractions.
   c) Calculate the angles at which the first dark band and next bright band are formed in the Fraunhofer diffraction of slit 0.3mm wide ($\lambda = 5890A^{o}$) [4M+4M+4M]

UNIT-II

4. a) What is population inversion? Give the different methods of achieving population inversion.
   b) Give the construction and working of Ruby laser and mention two applications. [4M+8M]

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(OR)

5. a) Derive the expressions for acceptance angle and numerical aperture of an optical fiber.
   b) Give two applications of optical fibers.
   c) Calculate the numerical aperture and hence the acceptance angle for an optical fiber whose core and cladding has refractive index of 1.59 and 1.40 respectively. [6M+2M+4M]

UNIT-III

6. a) Define coordination number and atomic radius.
   b) Show that FCC is most closely packed of the three cubic structures by working out the packing factors. [4M+8M]

(OR)

7. a) Derive an expression for interplanar spacing between two adjacent planes of Miller indices (hkl).
   b) Derive Braggs law of x ray diffraction. [6M+6M]

UNIT-IV

8. a) Define (i) Magnetic field induction(B) (ii) Magnetic field strength(H)
   b) Obtain the relation between B , H and I
   c) The magnetic field intensity in a piece of ferric oxide is 10^6 amp/m. If susceptibility of the material is 1.5×10^{-3}, calculate the magnetization of material and flux density. [2M +6M+4M]

(OR)

9. a) Define polarizability.
   b) Derive the expression for electronic polarizability.
   c) The dielectric constant of He gas at NTP is 1.0000684.Calculate the electronic polarizability of He atoms if the gas contains 2.7×10^{25} atoms per m^3. [2M+6M+4M]

UNIT-V

10. a) Define (i) Relaxation time (ii) Drift velocity and derive their expressions using classical theory.
    b) Calculate the free electron concentration , mobility and drift velocity of electrons in aluminium wire of length 5m and resistance 0.06Ω carrying a current of 15A, assuming that each aluminium atom contributes 3 free electrons for conduction. [6M +6M]

(OR)

11. a) Derive Schrodinger time independent wave equation.
    b) Give the physical significance of ψ. [8M+4M]

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13ME1002

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B. Tech II Semester Supplementary Examinations, August-2015
CLASSICAL MECHANICS
(MECHANICAL ENGINEERING)

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

PART- A

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

1. a) State Parallelogram law of forces.
   b) State Varignon's Principle of moments.
   c) Explain the term 'Resolution of forces'.
   d) What is meant by a 'Truss'?
   e) Explain the term 'Virtual Work'.
   f) State Pappus Guldinus Theorem.
   g) Define the term 'Moment of Inertia.
   h) Differentiate between kinetics and kinematics.
   i) What is a Moment of Momentum?
   j) Define Work.

PART-B

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

UNIT-I

2. A system of four forces acting on a body is as shown in Fig. 2. Determine the resultant.

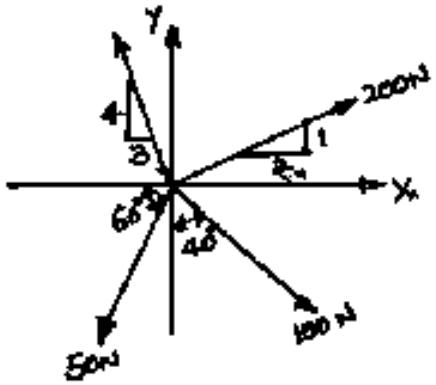

Fig.2

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(OR)

3. Determine the amount and direction of smallest force P required to start the wheel shown in Fig.3 over the block. What is the reaction at the block?

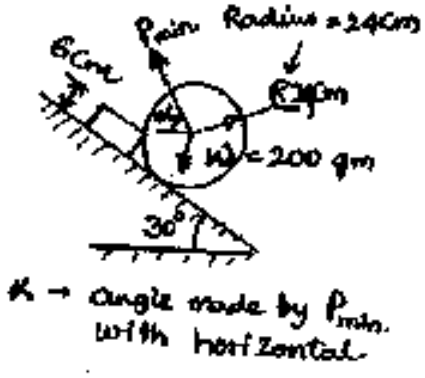

Fig.3

UNIT-II

4. Analyse the truss shown in fig.4

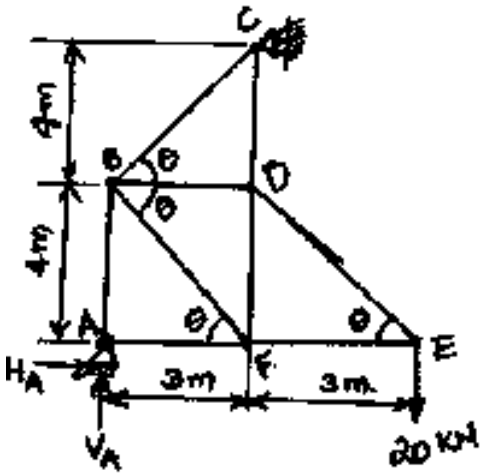

Fig.4

(OR)

5. Use the method of virtual work to determine the horizontal component of the reaction at C for the frame shown in Fig. 5

Fig.5

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UNIT-III

6. a) Determine the centriod of the shaded area shown in fig. 6(a). which is bounded by the X-axis , the line x=a and the parabola $y^2 = kx$.

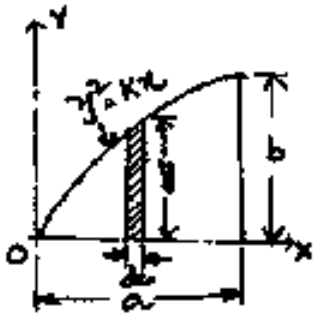

Fig.6 (a)

b) Determine the dimension b that will locate the centriodal axis at 4 cm. above the base of the section shown in fig. 6(b)

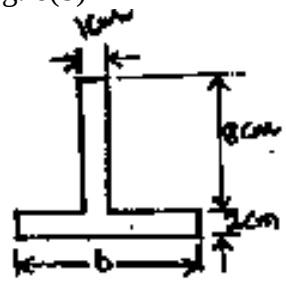

Fig.6(b)

(OR)

7. Determine the moment of inertia of the area shown in fig. 7 with respect to its centroidal axes.

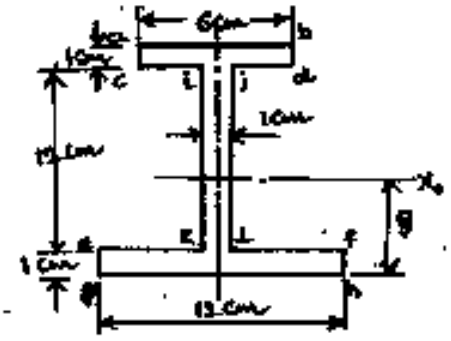

Fig.7

UNIT-IV

8. a) Car A at a gasoline station stays there for 10 min after a car B passes at an average speed of 40 mph.How long will take car A moving at an average speed of 50 mph to overtake car B.

b) A block weighing 1 kN rests on a horizontal plane as shown in fig.8(b) . Find the magnitude of the force P required to give the block an acceleration of 3 m/sec^2 to the right. The coefficient of friction between the block and the plane is 0.25.

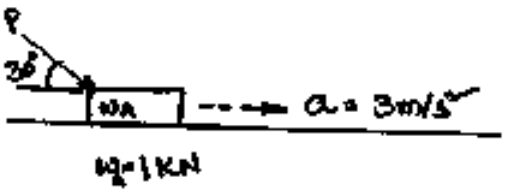

Fig.8(b)

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(OR)

9. a) A stone is thrown with an initial velocity of 100m/s upward at 60^o to the horizontal. Compute the radius of curvature of its path at the position where it is 50 m horizontally from its initial position.

   b) In what distance will body A of fig.9(b) attain a velocity of 10m/s, starting from rest.

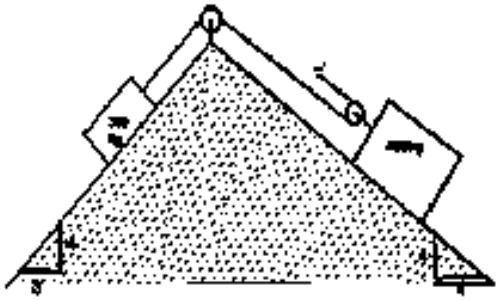

Fig.9(b)

UNIT-V

10. Determine the constant force P that will give the system of bodies shown in fig.10 . A velocity of 3 m/s after moving 4.5 m from rest. Coefficient of friction between the blocks and the plane is 0.3. Pulleys are smooth.

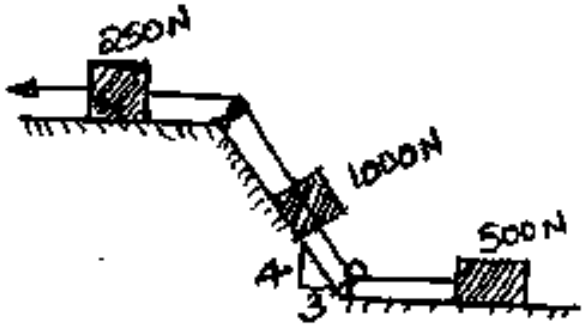

Fig.10

(OR)

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

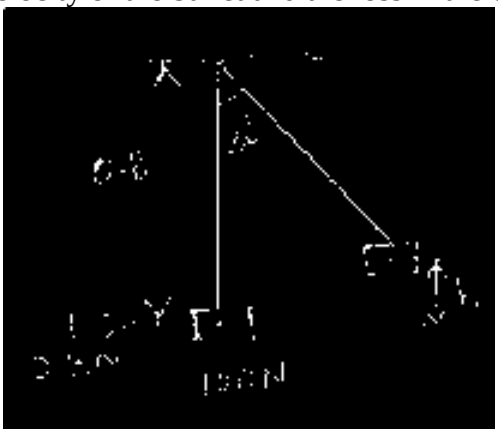

Fig.11