Seat No.	

S - 1389

SHIVAJI UNIVERSITY, KOLHAPUR

Subject : APPLIED MECHANICS **Code : 59185**

First Year Engineering Sem - I (New Course)

Day and Date : Thursday 26 - 12 - 2013 **Time :** 10.00 a.m. to 01.00 p.m.

Total Marks : 100

Note : i) All questions are compulsory.

ii) Figure to the right indicates full marks.

iii) Any missing data may be assumed suitably and clearly high lighted in the answer sheet.

iv) Neat sketches should be drawn whenever necessary.

v) Use of non-programmable calculator is allowed.

SECTION - I

Q.1 a. State and explain the following laws of forces 06

i) Law of Parallelogram of forces

ii) Law of Polygon of forces.

b. State the Varignon's Principle. 02

c. Find the resultant of forces acting on the bell crank lever shown. Also locate its position w.r.t. Hinge B. 08

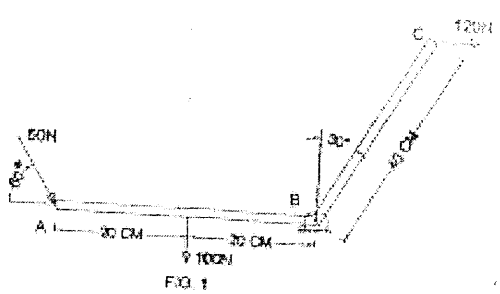


FIG. 1

$\Sigma H = 145 N$

$\Sigma V = -143.3 N$

$R = 203.8 N$

$\theta = 44.6°$

$d = 2.08 m$

Q.2 a. Write short notes on any two. 08

i) Free body Diagram

ii) Conditions of equilibrium

iii) Lami's Theorem

b. A weightless bar ABCD hinged at A rests on a smooth cylinder of weight 400N at point C. It is also supported by a cable BO. A vertical load of 1000N acts at D. Determine the support reactions and tension in the cable. 10

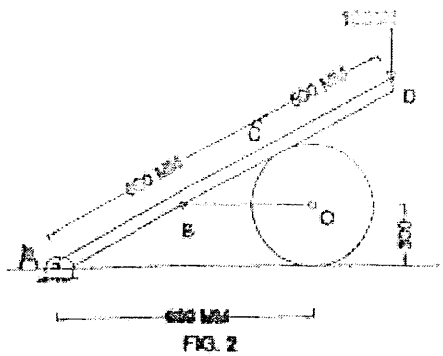


FIG. 2

$\Sigma M_A =$

$R_C = 1500\ N$

$H_A = 0.$

$V_A = -100.$

$R_C = 1833.3\ N.$

$T = 1466.6\ N$

OR

b. Using principle of Virtual work find the reaction at A and B for the beam CD 10 as shown in fig. 3.

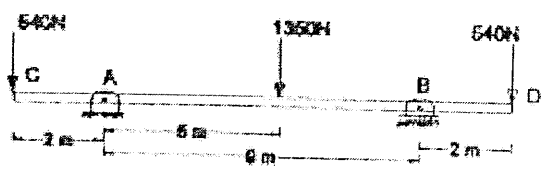


FIG. 3

$R_B = 1290\ N.$

$V_A = 1140\ N$

$H_A = 0.$

Q. 3 a. Define truss and Discuss the engineering Applications. 04

b. Determine the forces in each member of truss loaded and supported as shown in fig. 4. 12

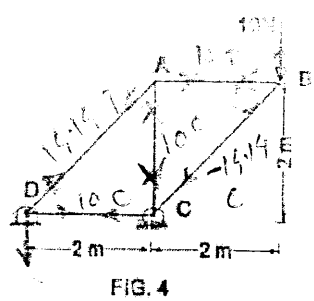


FIG. 4

$F_{AB} = 10\ kN$ (C)

$F_{AD} = 14.14\ kN$ (T)

$F_{AC} = 10\ kN$ (C)

$F_{CD} = 10\ kN$ (T)

Section - II

Q.4 a. What is Centroid and Moment of Inertia? State and prove parallel axis theorem. 06

b. Find the moment of Inertia of shaded area in Fig below about both the axis. 10

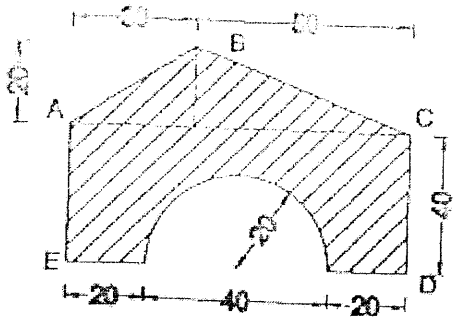


FIG. 5

Q.5 a. Write Short Notes on (any two) 08

i) Standard Motion Curves.

ii) D' Alembart's Principle

iii) Work- Energy Principle

iv) Impulse Momentum Principle

b. Determine the tension in the string and acceleration of block A &B weighing 10
1500N and 500N Connected by an inextensible string as shown in Fig. 6
Assume pulleys as frictionless and weightless.

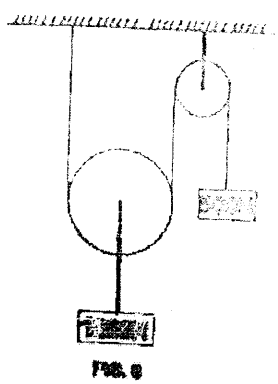
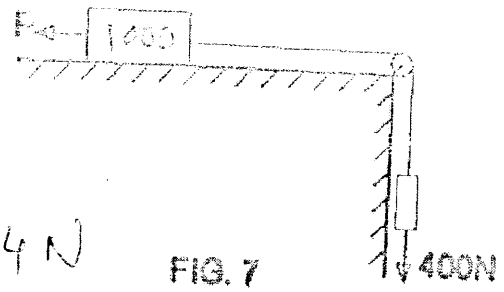


FIG. 6

OR 3

b. The system shown in fig. has a rightward velocity of 4m/ sec just before a force P applied. Determine the value of P that will give a leftward velocity of 6m/sec in a time interval of 20 sec. Take coefficient of friction = 0.2 and assume ideal pulley. Use impulse momentum principle. 10



N = 1000

F = 2000

P = 695.74 N

FIG. 7

Q.6 a. Explain with sketch Different types of impact. 06

b. Define Coefficient of Restitution. 02

c. A ball dropped from height 1 .6m on a floor rebound to a height of 0.90m. 08

e = 0.75