Registration No :

Total Number of Pages : 03

B.Tech.
BE2104

2nd Semester Back Examination 2017-18
MECHANICS
BRANCH : AEIE, AERO, AUTO,
BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC,
FASHION, FAT, IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA,
METTAMIN, MINERAL, MINING, MME, PE, PLASTIC, TEXTILE
Time : 3 Hours
Max Marks : 70
Q.CODE : C1123
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
**Answer all parts of a question at a place.**

Q1   **Answer the following questions:**   **(2 x 10)**

a) State and explain Parallelogram Law.

b) What is the condition for two coplanar forces to be in equilibrium?

c) State theorem of Varignon.

d) Differentiate between angle of repose and angle of friction.

e) State and explain Law of Superposition with a neat sketch.

f) State the difference between Newton's 2nd Law of motion and D'Alembert's Principle.

g) What do you understand by conservation of momentum?

h) What do you understand by coefficient of restitution?

i) What do you understand by moment of momentum?

j) Write the expression of equation of motion for a rigid body under rotation explaining each term.

Q2 **a)** Two spheres P and Q rest inside a hollow cylinder, which is resting on a horizontal plane as shown in the figure. If P=10kN and Q=20kN, find the reaction at D, the point of contact of Q with the ground.   **(5)**
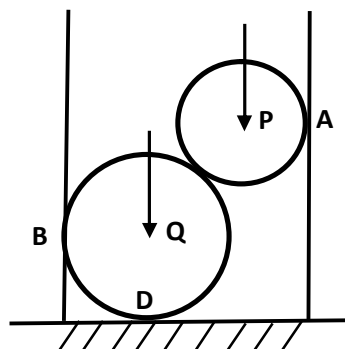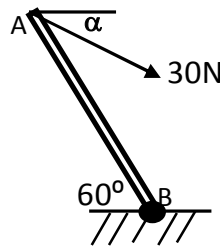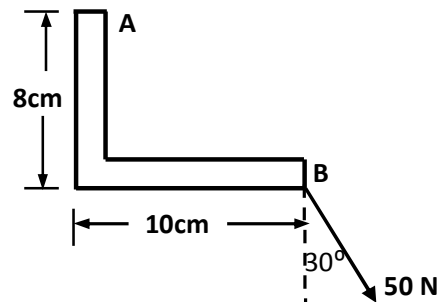
b) Determine the magnitude of the horizontal force P applied at the centre C of the roller of weight Q = 2500 N and radius r = 200 mm which will be necessary to pull it over a 50 mm curb as shown in the figure.   **(5)**
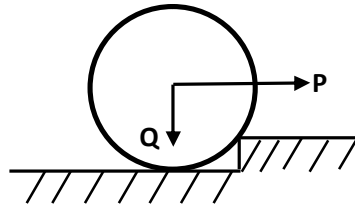
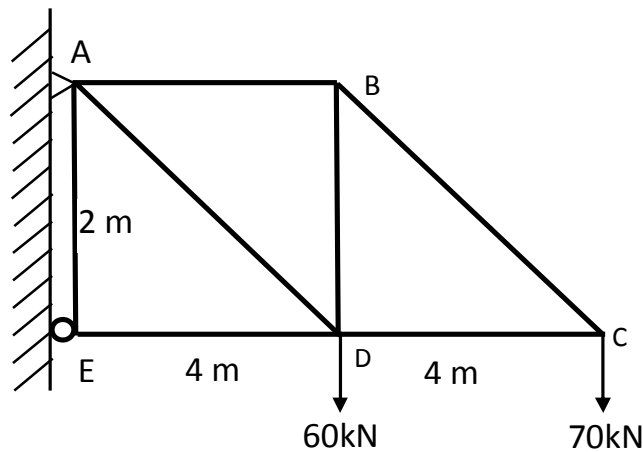**Q3 a)** A 30N force is applied to the control rod AB as shown. Knowing that the length of the rod is 30cm and that $\alpha=30°$, determine the moment of the force about point B.   **(5)**


b) A 50 N force is applied for a corner plate as shown. Determine an equivalent force-couple system acting at A.   **(5)**


Q4 Determine the force in each member of the truss as shown in the Figure.   **(10)**

Q5 **a)** State and prove the 1st theorem of Pappus. **(5)**
b) A 100kg block is resting on a horizontal plane. Find the magnitude of the force **(5)** required to give the block an acceleration of 3m/s^2 to the right. The coefficient of kinetic friction between the block and plane is 0.25.

P
30°
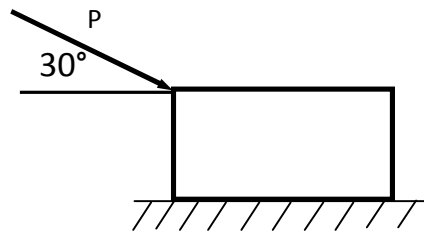
Q6 **a)** A stone is thrown from the top of a building of 30m height upward at an angle **(5)** of 40° to the horizontal with an initial speed of 30m/s. Determine the horizontal distance from the point of projection to the point where it strikes the ground and the velocity at that point of time.
b) A motorist travelling at a speed of 90km/h suddenly applies the brakes and **(5)** comes to a stop after skidding 50m. Determine (a) the time required for the car to stop (b) the coefficient of friction between the tires and the pavement.

Q7 The mass of the two step pulley as shown is 180kg and radius of gyration is **(10)** 180mm. Knowing that m_1=225N, m_2=100N, r_1=250mm, r_2=100mm, find the acceleration of m_1.

r_1 r_2

m_1 m_2
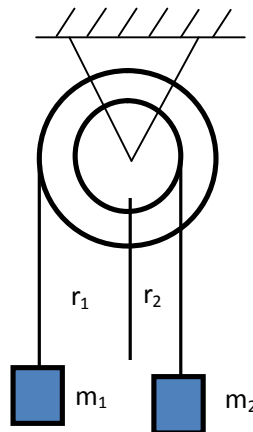
Q8 **Write short answer on any TWO:** **(5 x 2)**
a) Principle of Virtual Work
b) Parallel Axis and Perpendicular Axis theorem
c) Different methods of truss analysis
d) Short notes on Impulse and Momentum