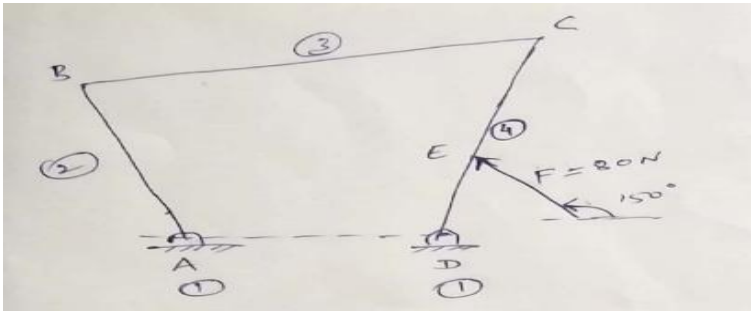
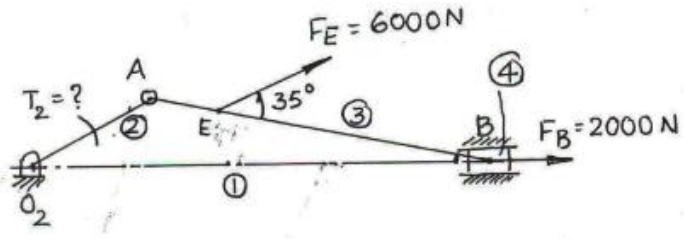


UNIT-I

S.No.	Questions	BT	CO	PO
Part – A (Short Answer Questions)				
1	What will be the effect of gyroscopic couple on a disc fixed at a certain angle to a rotating shaft?	L1	CO1	PO1,PO2
2	Which part of the automobile is subjected to the gyroscopic couple and define reactive gyroscopic couple?	L1	CO1	PO1,PO2
3	State the effect of gyroscopic couple on rolling of ship. Justify your answer	L4	CO1	PO1,PO2
4	Define steering, pitching and rolling. (Or) List some of the terms related to motion of ships using gyroscopic principle.	L1	CO1	PO1,PO2
5	Write the expression for gyroscopic couple and Give the application of gyroscopic principle.	L1	CO1	PO1,PO2
6	Explain briefly about spin, precession and gyroscopic planes?	L1	CO1	PO1,PO2
7	State D' Alembert's principle?	L1	CO1	PO1,PO2
8	Differentiate between static & dynamic equilibrium.	L2	CO1	PO1,PO2
9	Differentiate between static force analysis and dynamic force analysis.	L2	CO1	PO1,PO2
10	How you will reduce a dynamic analysis problem into an equivalent problem of static equilibrium and What is meant by Equivalent offset inertia force?	L3	CO1	PO1,PO2
Part – B (Long Answer Questions)				
11	a) Describe the effect of the gyroscopic couple on a disc fixed at a certain angle to a rotating shaft?	L2	CO1	PO1,PO2
	b) Develop the expression for gyroscopic couple.	L3	CO1	PO1,PO2
12	The turbine rotor of a ship has a mass of 2000 kg and rotates at a speed of 3000 rpm clockwise when viewed from stern. The rotor has radius of gyration of 0.5 m. (a) Determine the gyroscopic couple and its effect when the ship steers to the right in a curve of 100 m radius at a speed of 16.1 knots (1 knot = 1855 m/h). (b) Calculate the torque and its effects when ship pitches simple harmonic motion, the bow falling with its maximum velocity, the period of pitching is 50 seconds and the total angular displacement between two extreme positions of pitching is 12 degrees. Find the maximum acceleration during the pitching motion.	L3	CO1	PO1,PO2
13	a) An aero-plane makes a half circle of 100 m radius towards left when flying at 400 kmph. The engine and propeller of plane weigh 500 kg, and have a radius of gyration of 30 cm. The engine rotates at 3000 rpm ccw, when viewed from the front end. Determine the gyroscopic couple and state its effect.	L3	CO1	PO1,PO2

	b)	Develop equation for the limiting value of the Angle of heel (θ) to avoid skidding of two-wheeled vehicle.	L3	CO1	PO1,PO2
14		A rear engine automobile is travelling along a track of 100 m mean radius. Each of the four road wheels has a moment of inertia of 2.5 kg-m^2 and an effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.2 kg-m^2 . The engine axis is parallel to the rear axle and the crank shaft rotates in the same sense as the road wheels. The ratio of engine speed to back axle speed is 3:1. The automobile has a mass of 1600 kg and has its centre of gravity 0.5 m above road level. The width of the track of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around the curve for all four wheels to maintain contact with the road surface. Assume that the road surface is not cambered and centre of gravity of the automobile lies centrally with respect to the four wheels.	L3	CO1	PO1,PO2
	a)	A motor cycle along with the rider weighs 2 KN, the center of gravity of the machine and rider combined being 60 cm above the ground, with the machine in vertical position. The moment of inertia of each road wheel is 1.030 kg-m^2 , and the rolling diameter is 60 cm. The engine rotates at 6 times of the road wheels and in the same sense. The moment of inertia of rotating parts of the engine is 0.165 kg-m^2 . Determine the angle of heel necessary if the unit is speeding at 62.5 km/h round a curve of 30.4 m.	L3	CO1	PO1,PO2
15	b)	A four link mechanism with following dimensions is acted upon by a force 80N at angle of 150 degrees on link DC. As shown in figure AD=50mm, AB=40mm, BC=100mm, DC=75mm, DE=35mm. Determine the input torque T on the link AB for the static equilibrium of mechanism for the given configuration.	L4	CO1	PO1,PO2
			L4	CO1	PO1,PO2
16	a)	Determine T_2 to keep the body in equilibrium. $O_2A = 100\text{mm}$, $AB=250\text{mm}$, $AE=50\text{mm}$, angle AO_2B is 30°	L4	CO1	PO1,PO2
			L4	CO1	PO1,PO2