ALPHA COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

ASSIGNMENT-1

CLASS- 5TH ME-A   SUBJECT- TOM(2151902)   TOPIC- FLYWHEEL

SOLVE ALL THE QUESTIONS

NO	QUESTION	YEAR	MARK
1	Draw and explain to the point turning moment diagram of a 4-Stroke single cylinder Engine.	DEC 2010, DEC 2013	7
2	A flywheel, which is rotating at a maximum speed of 250r.p.m. and is having radius of gyration as 0.5 m, is attached to a punching press. The press is driven by a constant torque electric motor and punches 750 holes per hour. Each punching operation requires 14000 N-m of energy and takes 1.8 seconds. If the speed of the flywheel is not to fall below 225r.p.m. Find: (i) power of the motor and (ii) mass of the flywheel.	JUNE2011	7
3	What is the function of Flywheel. And define these terms: Coefficient of fluctuation of speed and coefficient of fluctuation of energy. (ii) Derive a relation for the coefficient of fluctuation of speed in terms of maximum fluctuation of energy and the kinetic energy at mean speed.	MAY2013, JUN2010, DEC2014, MAY2015	7,4
4	The turning moment diagram for a multicylinder engine has been to drawn to a scale of 1 mm to 500 N-m torque and 1 mm to 6° of crank displacement. The intercepted areas between output torque curve and mean resistance line taken in order from one end in sq. mm are, -30,+410,-280,+320,-330,+250,-360,+280,-260 sq. mm when the engine is running at 800 RPM. The engine has a stroke of 300mm and the fluctuation of speed is not to exceed 2% of the mean speed. Determine a suitable diameter and cross section of the Flywheel rim for a limiting value of the safe centrifugal stress of 7 MPa. The material density may be assumed as 7200 Kg/m3. The width of Rim is to be 5 times the thickness.	DEC2012, JUN2015	7
5	The turning moment diagram for a petrol engine is drawn to a vertical scale of 1 mm = 5 N.m and a horizontal scale of 1 mm = 1^0. The turning moment repeats itself after every half revolution of engine. The areas above and below the mean torque line are 305, 710, 50, 350, 980 and 275 mm2. The rotating parts amount to a mass of 40 kg at a radius of gyration of 140 mm. Calculate the coefficient of fluctuation of speed if the speed of the engine is 1400 rpm.	JUNE2013	7

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ASSIGNMENT-2

CLASS- 5TH ME-A **SUBJECT- TOM(2151902)** **TOPIC- GYROSCOPE**

SOLVE ALL THE FIVE QUESTIONS:-

SN	QUESTION	YEAR	MARK
1	The turbine rotor of a ship has a mass of 2.2 tones and rotates at 1800 r.p.m. clockwise when viewed from the left. The radius of gyration of the rotor is 320mm. Determine the gyroscopic couple and its effect when (1) Ship turns right at a radius of 250m. with a speed of 25 km/hr. (2) Ship pitches with the bow rising at an angular velocity of 0.8 rad/sec. (3) Ship rolls at an angular velocity of 0.1 rad/sec	**DEC2010**	**7**
2	Find the angle of inclination with respect to the vertical of a two wheeler negotiating a turn .Following data is given: combined mass of the vehicle with its rider 250 kg, moment of inertia of the engine flywheel 0.3 kg.m 2 , moment of inertia of each road wheel 1 kg.m 2 ,speed of engine flywheel five times that of road wheels and in the same directions, height of centre of gravity of rider with vehicle 0.6 m ,two wheeler speed 90 km/h, wheel radius 300 mm ,radius of turn 50 m.	**JUNE2011**	**7**
3	**(A)** Explain gyroscopic couple and discuss its effect on an aeroplane taking turns when viewed from rear. **(B)** Discuss gyroscopic effects on naval ships.	**DEC2010, JUNE2012 JUNE2013**	**4,7**
4	**i)** What is gyroscopic couple? Derive a relation for its magnitude. **(ii)** The moment of inertia of an aero plane air screw is 20 kg.m 2 and the speed of rotation is 1250 rpm clockwise when viewed from the front. The speed of the flight is 200 km/hr. Calculate the gyroscopic reaction of the air screw on the aero plane when it makes a left hand turn on a path of 150 m radius.	**DEC2012, JUNE2013**	**7**
5	A rear engine automobile travelling along a track of 100 m mean radius has 4 wheels each of 2 kg.m 2 and 0.6 m radius. Rotating parts of engine have moment of inertia of 1 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 gear ratio, engine to back axle, is 3:1. The vehicle weighs 14.17 kN and has its CG 0.5 m above the ground level. Determine speed of the vehicle around the curve for all four wheels to maintain contact with the road surface if wheel track is 1.5 m.	**MAY2015**	**7**

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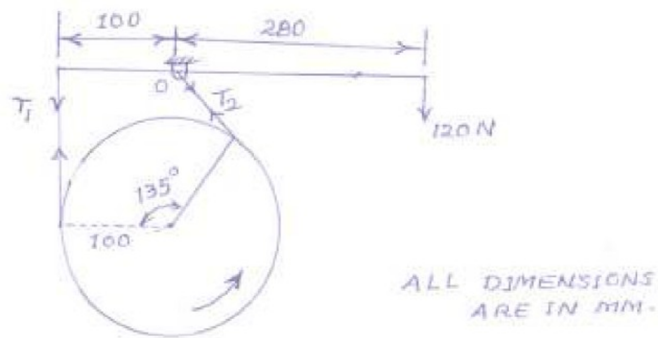
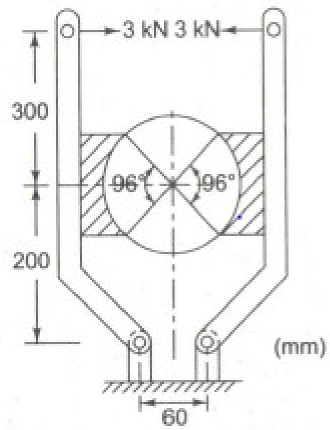
ASSIGNMENT-3

CLASS- 5TH ME-A SUBJECT- TOM(2151902) TOPIC- FRICTIONAL DEVICES

SOLVE ALL THE QUESTIONS

SN	QUESTION	YEAR	MARK
1	**(A)** What is meant by a self locking and a self energized brake? **(B)** A simple band brake (refer fig-1) is applied to a shaft carrying a flywheel of 250 kg mass and of radius of gyration of 300 mm. The shaft speed is 200r.p.m. The drum diameter is 200 mm and the co efficient of friction is 0.25. Determine the (1) The brake torque when a force of 120 N is applied at the lever end. (2) Number of turns of the flywheel before it comes to rest.  Q-(1) (b) FIG. 1	**DEC2010**	**7**
2	A torsion dynamometer is fitted to a propeller shaft of a marine engine. It is found that the shaft twists 2° in a length of 20 meters at 120 r.p.m. If the shaft is hollow with 400mm external diameter and 300 mm internal diameter, find the power of the engine. Take modulus of rigidity for the shaft material as 80GPa.	**JUNE2011**	**7**
3	**(a)** Describe the constuction and operation of a prony rope bake absorption dynamo-meter. **(b)** With the help of a neat sketch also explain the working of a block of shoe brake.	**DEC2011**	**7**
4	A band and block brake has 14 blocks each of which subtends an angle of 14°at the centre. The brake is applied to a drum of 0.8 m diameter. The blocks are 100 mm thick. The drum and flywheel mounted on the same shaft has a mass of 2000 kg and combined radius of gyration of 500 mm. The two ends of the bands are fastened to pins on the opposite sides of brake lever at distances 35 mm and 140 mm from the fulcum. An effort of 250 N is applied at a distance 800 mm from the fulcrum. The co-efficient of friction between the blocks and drum is 0.3 Determine (i) Maximum braking torque (ii)	**DEC2012**	**7**

	angular retardation of the drum (iii) Time taken by the system to come to stop from the rated speed of 300 rpm.		
5	Determine the maximum torque for a shoe brake shown in figure 1. The diameter of the brake drum is 400 mm and the angle of contact is 96. The applied force is 3 KN on each arm and the coefficient of friction between the drum and the lining is 0.35.  	**JUNE2013**	**7**
6	What is a function of dynamometer? List out the different types of dynamometers.	**DEC2013, MAY2014**	**7**

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ASSIGNMENT-4

CLASS- 5TH ME-A SUBJECT- TOM(2151902) TOPIC- INTRODUCTION TO DYNAMICS

SOLVE ALL THE QUESTIONS

SN	QUESTION	YEAR	MARK
1	In I.C. Engine,the crank radius is 300mm and length of connecting rod is 750mm. The mass of the piston is 1.25kg and diameter of the piston is 100mm. The speed is 900 rpm and net gas pressure is 750kN/ m2.Find: 1. Piston Effort, 2. Thrust in connecting rod, 3. Piston sidethrust, 4. crank pin effort, 5. Torque acting on crankshaft and 6. Radial force or load on main bearings when crank has made 45 from TDC	**MAY2017**	**7**
2	Derive the expression for total torque on crank shaft of IC engine by considering dynamic force.	**MAY2017**	**7**
3	A single cylinder vertical engine has a bore of 150 mm and a stroke of 200 mm. The connecting rod is 350 mm long. The mass of piston is 1.6 kg and engine speed is 1800 r.p.m. On the expansion stroke with a crank at 30 0 from the top dead centre, the gas pressure is 750 kN/m^2 . Determine the net thrust on the engine.	**JUNE2012**	**7**
4	**(A)** State: D'Alembert's principle. **(B)** Impulse and Momentum **(C)** Shaking force and shaking Momentum **(D)** State the condition for Equilibrium.	**DEC2011, JUNE2013**	**7**
5	A connecting rod is suspended from a point 40mm above the center of small end and 700mm above its center of gravity, its mass being 42 kg, when permitted to oscillate, the time period is found to be 2.2 second. Find the dynamical equivalent system constituted of two masses, one of which is located at the smaal end center.	**MAY2011**	**7**
6	Explain shaking forces and shaking moments. Derive their expressions fora four bar linkage	**MAY2015**	**7**