BT MRE-V-12.14-1156 Reg.No. | | | | | | | | |

B

B.Tech. Degree V Semester Examination in Marine Engineering December 2014

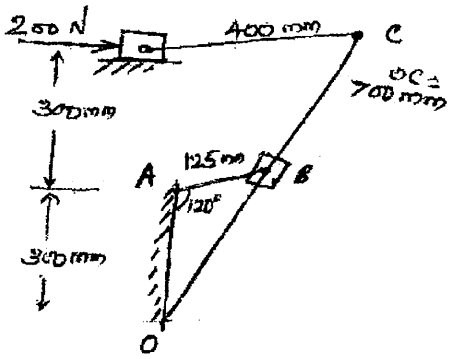
MRE 501 DYNAMICS OF MACHINERY

Time : 3 Hours Maximum Marks : 100

(5 x 20 = 100)

I. (a) What are shaking forces and moments? Explain.

(b) Determine the torque required to be applied at link AB for the static equilibrium of the mechanism shown.



OR

II. The piston diameter of an internal combustion engine is 125 mm and the stroke is 220 mm. The connecting rod 4.5 tones the crank length and has a mass of 50 kg. The mass of the reciprocating parts is 30 kg. The centre of mass of the connecting rod is 170 mm from the crank pin centre and the radius of gyration about axis passing through the centre of man is 150 mm. The engine runs at 320 rpm. Find the magnitude and direction of the inertia force and the corresponding torque on the crankshaft when the angle turned by the crank is 140° from inner dead centre.

III. (a) Obtain the expression for the coefficient of fluctuation of speed for a fly wheel.

(b) The torque delivered by a two stroke engine is represented by T = (1000+300 sin 2 θ - 500 cos 2 θ) Nm where θ is the angle turned by the crank from the inner dead centre. The engine speed is 250 rpm. The mass of flywheel is 400 kg and radius of gyration 400 mm. Determine the

(i) power developed
(ii) total % fluctuation of speed
(iii) angular acceleration of flywheel when the crank has turned 60° from inner dead centre
(iv) maximum angular acceleration and deceleration of the flywheel.

OR

(P.T.O.)

IV. A 2.2 tonne racing car has a wheel base of 2.4 m and a track of 1.4 m. The centre of mass of the car lies at 0.6 m above the ground and 1.4 m from the rear axle. The equivalent mass of engine parts is 140 kg with a radius of gyration of 150 mm ratio of engine speed to wheel speed is 5. The engine and fly wheel rotate clockwise when viewed from front. Each wheel has a diameter of 0.8 m and a moment of inertia of 0.7 kgm^2. Determine the load distribution on the wheels when the car is rounding a curve of 100 m radius at a speed of 72 km/hr to the left.

V. Four masses A, B, C and D are completely balanced. Masses C & D makes angles of 90° and 195 ° respectively with that of mass B in the counter clockwise direction. The rotating masses have the following properties m_b = 25kg, m_c = 40 kg, m_d = 35 kg, r_a = 150 mm, r_b = 200 mm, r_c = 100 mm, r_d = 180 mm. Planes B & C are 250 mm apart. Determine the mass A and its angular position with mass B. Also determine the positions of all planes relative to mass A.

OR

VI. The intermediate cranks of a 4 – cylinder symmetrical engine, which is in complete primary balance, are at 90 ° to each other and has a reciprocating mass of 400 kg. The centre distance between intermediate cranks is 600 mm and between extreme cranks, it is 1800 mm. Lengths of connecting rod is 900 mm and crank radius is 200 mm. Calculate the masses fixed to the extreme cranks with their relative angular positions. Also find the magnitude of the secondary forces and couples about the centre line of the system of the engine speed is 500 rpm.

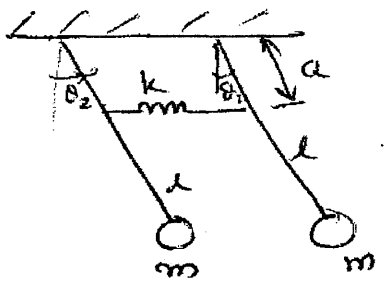
VII. (a) Derive the expression for the displacement of a spring-mass-damper system, when the system is under damped.

(b) Explain the working of an accelerometer.

OR

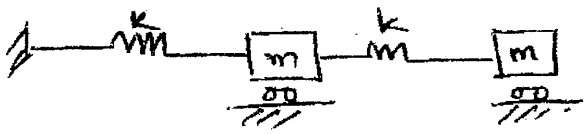
VIII. A rotor has a mass of 12 kg and is mounted midway on a 25 mm diameter horizontal shaft supported at the ends by two bearings. The bearings are 1m apart. The shaft rotates at 2400 rpm. If the centre of mass of the rotor is 0.2 mm away from the geometric centre of the rotor due to a certain manufacturing defects. Find the amplitude of steady state vibration and the force transmitted to the bearing if E = 200 gla.

IX. Find the natural frequencies and mode shapes of the system shown.



OR

X. Find the natural frequencies and mode shapes of the system shown.



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