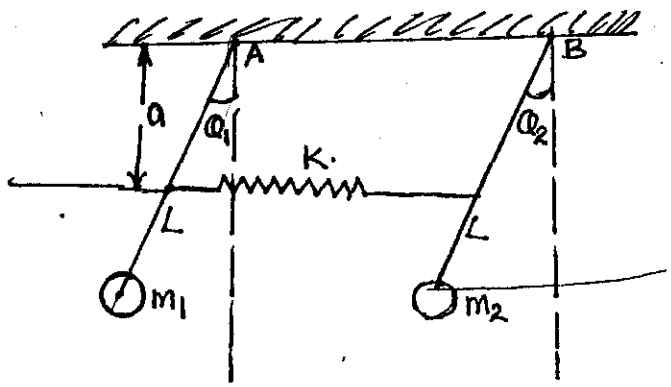
IX a) Briefly explain the working of "Accelerometer".

b) Consider two pendulums of Length L as shown in figure. Determine the natural frequency of each pendulum. If k = 100 N/m m_1 = 2 kg. m_2 = 5 kg. L = 20 m a = 10 m.



OR

X a) What is meant by "Co-ordinate coupling"?

b) The moments of Inertia of three rotors A, B and C are 0.3, 0.6, and 0.18 kg-m^2 respectively. The distance between A and B is 1.5m and between B and C is 1m. The shaft is 70mm in diameter and the modulus of rigidity for the shaft material is 84 x 10^9 N/m^2. Find,

(i) The frequencies of torsional vibrations.
(ii) Position of nodes and
(iii) Amplitude of vibrations.

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BTS(C) 051(B)

B.Tech. Degree VI Semester Examination, July 2002

ME 601 DYNAMICS OF MACHINERY

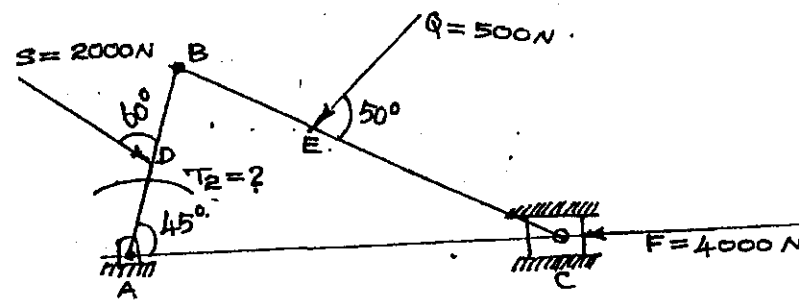
(1999 Admissions)

Time: 3 Hours *Max. Marks: 100*

(All questions carry equal marks)

I a) Define and explain the terms "Friction Circle" and "Friction Axis" of a link.

b) Solve the problem as shown in figure for T_2
Various dimensions of links are given.
AB = 30 CM BC = 45.5CM BE = 17.5 CM AD = 15CM
neglect sliding friction and pin friction.



OR

II a) Briefly explain shaking force of a machine.

b) Determine the Inertia force magnitude and location for each link of a four-bar mechanism with the following data:-
O_2A = 25 CM mass = 2.5 kg. (crank)
AB = 30 CM mass = 1 kg.
O_4B = 30 CM mass = 2.5 kg.
O_2O_4 = 50 CM (Fixed link)
Angle $AO_2O_4 = 60°$. The crank O_2A. rotates with a speed of 2500 RPM counter clockwise. The center of gravity of each link is at its midpoint.

(P.T.O)

III a) Explain the following terms:-
Thrust on crank shaft bearings and Thrust on cylinder walls.

b) The torque delivered by a two-stroke engine is represented by $T = (1000 + 300 \sin 2\theta - 500 \cos 2\theta)$ N – m where θ is the angle turned by the crank from the inner-dead centre. The engine speed is 250 RPM. The mass of the fly wheel is 400 kg. and radius of gyration 400 mm.
Determine (i) The power developed
(ii) The total percentage fluctuation of speed.

OR

IV a) Derive an expression for Gyroscopic Torque in standard form.

b) An aeroplane flying at 240 km/hr. turns towards left and completes a quarter circle of 60m radius. The mass of the rotary engine and the propeller of the plane amounts to 450 kg. with a radius of gyration of 320 mm. The engine speed is 2000 RPM clockwise when viewed from the rear. Determine the gyrascopic couple on the aircraft and state its effect.
In what way is the effect changed when:
(i) The aeroplane turns towards right.
(ii) The engine rotates clockwise when viewed from the front (nose end) and the aeroplane turns (a) left (b) right?

V a) Define the terms Primary and Secondary balancing as used for balancing of reciprocating masses.

b) A shaft carries four rotating masses A, B, C and D. in this order along its axis. The mass A may be assumed to be concentrated at radius of 18cm. B of 24 cm, C of 12 cm and D of 15 cm. The masses of B, C and D are 30 kg, 50 kg. and40 kg. respectively. The planes containing B and C are 30 cm apart. The angular spacing of the planes containing C and D are 90° and 210° respectively relative to B measured in the same plane. If the shaft and masses are to be in complete dynamic balance. Find
(i) The mass and the angular position of mass A
(ii) The position of plane A and D

OR

Contd....3

VI a) Explain the terms for an uncoupled two cylinder locomotive engine.
(i) Hammer blow (ii) Variation in tractive effort
(iii) Swaying couple.

b) A 90° -V engine has two cylinders which are placed symmetrically. The two connecting rods operate a common crank. The length of connecting rods are 320mm each and crank radius is 80mm. The reciprocating mass per cylinder is 12 kg. If the engine speed is 600 rpm, then find the resultant primary and resultant secondary forces. Also find the maximum resultant secondary force.

VII a) Define and explain the terms:- Free vibration, Forced vibration and Damped vibration.

b) A shaft 1.5 m long supported in flexible bearings at the ends carries two wheels each of 50 kg. mass. One wheel is situated at the centre of the shaft and the other at a distance of 375mm from the centre towards left. The shaft is hollow of external diameter 75mm and internal diameter 40mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Find the lowest whirling speed of the shaft, taking into account the mass of the shaft.

OR

VIII a) What is meant by "Logarithmic decrement" ?
Find an expression for Logarithmic decrement in terms of damping factor.

b) A machine of mass 68 kg. is mounted on springs of stiffness, k = 11,000 N/cm with an assumed damping factor of $\tau = 0.20$ A piston within the machine of mass 2 kg. had a reciprocating motion with a stroke of 7.5 cm and speed of 3000 rpm. Assuming the motion of the piston to be simple harmonic determine
(i) The amplitude of the machine.
(ii) The Transmissibility and the force transmitted to the foundation.

Contd....4