BT-MRE-V(S)-12.18-1925 Reg. No. | | | | | | | | |

A

B.Tech. Degree V Semester Supplementary Examination in Marine Engineering December 2018

MRE 501 DYNAMICS OF MACHINERY

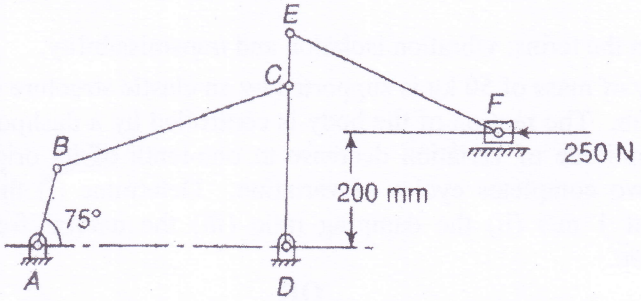
(Prior to 2013 Scheme)

Time: 3 Hours Maximum Marks: 100

(5 × 20 = 100)

I. (a) Define inertia force and inertia torque. (5)

(b) For the static equilibrium of the mechanism shown in the figure, determine the required input torque. The dimensions of the various links are AB = 150 mm, BC = AD = 500 mm, DC = 300 mm, CE = 100 mm and EF = 450 mm. (15)



OR

II. (a) What is meant by shaking force? Explain. (5)

(b) The crank and connecting rod of a petrol engine running at 1800 rpm are 50 mm and 200 mm respectively. The diameter of the piston is 80 mm and the mass of the reciprocating parts is 1 kg. At a point during power stroke the pressure on the piston is 0.7 N/mm^2, when it has moved 10 mm from the IDC. Find (i) Net load on the gudgeon pin (ii) Thrust in the connecting rod (iii) Reaction between friction and cylinder (iv) The engine speed at which the above values become zero. (15)

III. (a) What are the three types of movements of ship? Explain. (5)

(b) A single cylinder double acting steam engine develops 130 KW at a mean speed of 78 r.p.m. The coefficient of fluctuation of energy is 0.1 and the fluctuation of speed is ±2% of mean speed. If the mean diameter of the flywheel rim is 1.8 metre and the hub and spokes provide 6% of rotation inertia of the flywheel, find the mass and cross-sectional area of the flywheel rim. The density of the cast iron flywheel rim is 7200 kg/m^3. (15)

OR

IV. (a) Explain with neat sketch the turning moment diagram of a four stoke IC engine. (6)

(b) The engine and propeller has a mass of 500 kg and the radius of gyration 450 mm. The propeller of the engine rotates at 3000 r.p.m. in clockwise direction when viewed from the rear. If the aeroplane turns towards left and makes quarter of a circle of radius 90 m while flying at 240 km/hr. (14)

(i) Determine the gyroscopic couple on the aircraft and state its effect.

(ii) In what way is the effect changed when,

(a) The aeroplane turns towards right.

(b) The engine rotates clockwise when viewed from the nose end and the aeroplane turns left.

(P.T.O.)

V. (a) Explain the term 'static balancing' and 'dynamic balancing'. (5)

(b) A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. (15)

OR

VI. (a) What are the effects of partial balancing of locomotives? (5)

(b) The reciprocating mass per cylinder in a 60° V-twin engine is 1.5 kg. The stroke is 100 mm for each cylinder. If the engine runs at 1800 r.p.m, determine the maximum and minimum values of the primary forces and find out the corresponding crank position. (15)

VII. (a) Explain the terms: vibration isolation and transmissibility. (5)

(b) A body of mass of 50 kg is supported by an elastic structure of stiffness 10 kN/m. The motion of the body is controlled by a dashpot such that the amplitude of variation decrease to one-tenth of its original value after two completes cycles of variation. Determine (i) the damping force at 1 m/s (ii) the damping ratio (iii) the natural frequency of vibration. (15)

OR

VIII. (a) Explain the working principle of seismometer and accelerometer. (10)

(b) Calculate the whirling speed of a shaft 25 mm diameter and 0.7 m long carrying a mass of 1 kg at its mid-point. The density of the shaft material is 40000 kg/m^3, and E = 210 GN/m^2. Assume the shaft to be freely supported. (10)

IX. (a) Explain the Rayleigh's method in determining the frequency for transverse vibrations. (5)

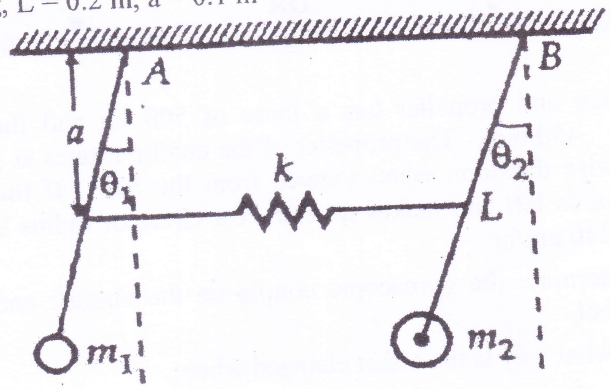
(b) The moments of inertia of three rotors A, B and C are respectively 0.3, 0.6 and 0.18 kgm^2. The distance between A and B is 1.5 m and between B and C is 1 m. The shaft is 70 mm in diameter and modulus of rigidity for the shaft material is 84 GN/m^2. Find: (15)

(i) The frequency of torsional vibrations

(ii) Position of nodes

OR

X. Consider two pendulums of length L as shown in the figure. Determine the natural frequency of each pendulum, if k = 100 N/m, m_1 = 2 kg, m_2 = 5 kg, L = 0.2 m, a = 0.1 m (20)



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