Name : ..... Roll No : .....

MAR ATHANASIUS COLLEGE OF ENGINEERING

(Government Aided Autonomous Institution)
Kothamangalam, Kerala – 686 666

DEPARTMENT OF MECHANICAL ENGINEERING

B24ME3T01 – DYNAMICS AND DESIGN OF MACHINES

First Sessional Examination – August 2026

Duration: 1 hour 30 minutes **S5 ME A & B Batch** **Max. Marks: 40**

Part A

(1) State and explain D' Alembert's principle.(CO1) (3)

(2) Draw and explain the turning moment diagram for a four stoke I.C. Engine.(CO1) (3)

(3) Draw and explain the parts of a vibrating system. (CO2) (3)

(4) A spring mass system (k_1- m_1) has a natural frequency f_1. Calculate the value of k_2, another spring which when connected to k_1 in parallel increase the frequency by 30% .(CO2) (3)

Part B

(5) a. A horizontal steam engine running at 180 rpm has a bore of 320 mm and stroke 560 mm. The connecting rod is 1 m long and the mass of the reciprocating parts is 50 kg. When the crank is 50° past inner dead centre, the steam pressure on the cover side of the piston is 1.2 MPa, while that on the crank side is 0.15 MPa. Neglecting the area of the piston rod, determine (a) The force on the piston, and (b) turning moment on the crankshaft. (CO1) (7)

b. The turning movement diagram for petrol engine is drawn in the following scale. Turning moment, 1 mm = 5 Nm Crank angle = 1 mm = 1° The turning movement diagram repeats itself at every half revolution of the engine. The area above and below the mean torque line are 295 mm^2 685 mm^2, 40 mm^2, 340 mm^2, 960 mm^2, 270 mm^2. The rotating parts have mass of 30 kg with radius of gyration 120 mm. Find co-efficient of fluctuation of speed, if the engine revolves at 1500 rpm. (CO1) (7)

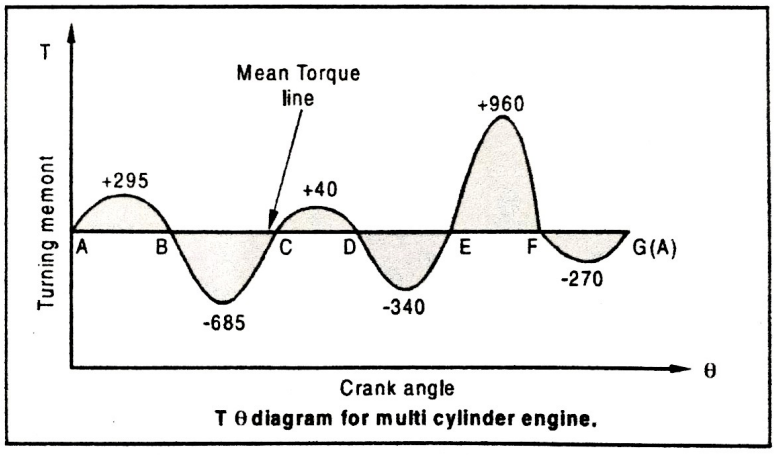


Figure 1: Turning Movement Diagram

P.T.O.

(6) a. The mass of flywheel of an engine is 8 tonnes and the radius of gyration is 1.8 meters. The maximum fluctuation of energy is 60 kNm. Mean speed of the engine is 140 rpm. Find the maximum and minimum speeds. (CO1) (7)

b. Find the natural frequency of the system shown in figure. Given k=2 x 10^5 N/m, m=20kg. (CO2) (7)

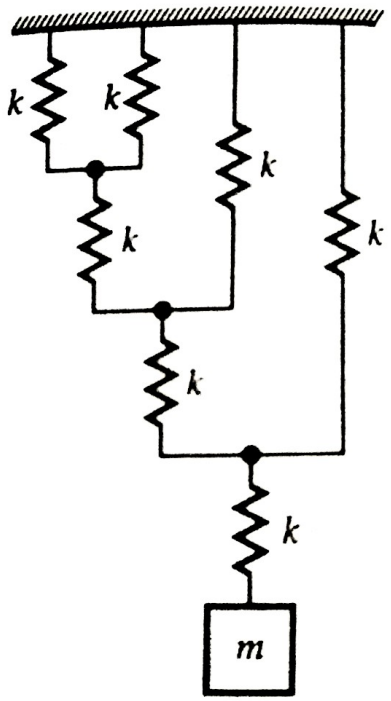


Figure 2: Spring Mass System

Vision

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Mission

1. To facilitate comprehensive and integrated development of students by providing quality education that encourages sustainable practices.

2. To mould disciplined and socially committed engineers capable of assuming professional leadership upholding national integrity.