Code No.: ME502PC | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Supply) - May- 2023
DYNAMICS OF MACHINERY
(MECH)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks.

PART-A **(20 Marks)**

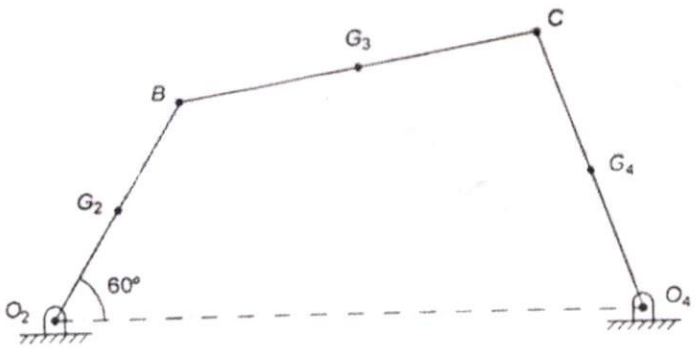
1. a) Analyze the Gyroscopic effect on Sea vessels? [2M]
   b) State and explain D'Alembert's principle. [2M]
   c) What is the main function of a flywheel? [2M]
   d) Compare the terms fluctuation of energy and fluctuation of speed? [2M]
   e) Illustrate the advantages of friction with an application. [2M]
   f) Distinguish between brakes and dynamometers. [2M]
   g) Define the sensitiveness and isochronisms related to governors? [2M]
   h) Illustrate how a single revolving mass is balanced by two masses revolving in different planes? [2M]
   i) Elucidate the advantages of vibration with a suitable example? [2M]
   j) Explain the terms critical damping and under damping? [2M]

PART-B **(50 Marks)**

2. A pair of locomotive driving wheels with the axle has a moment of inertia of 180 kg-m^2. The diameter of the wheel treads is 1.8 m and the distance between wheel centers is 1.5 m. When the locomotive is travelling on a level track at 95 km/h, defective ballasting causes one wheel to fall 6 mm and to rise again in a total time of 0.1 s. If the displacement of the wheel takes place with simple harmonic motion, find : 1. The gyroscopic couple set up, and 2. The reaction between the wheel and rail due to this couple. [10M]

OR

3. A four-bar mechanism shown in Fig. has the following length of various links:O_2O_4 = 80 mm, O_2B = 330 mm, BC = 500 mm, O_4C = 400 mm, O_2G_2 = 200 mm, BG_3 = 250 mm, O_4G_4 = 200 mm. The masses of links are: m_2 = 2.2 kg, m_3 = 2.5 kg, m_4 = 2 kg. The moment of inertia links about their C.G. are I_2 = 0.05 kg · m^2, I_3 = 0.07 kg · m^2. I_4 = 0.02 kg · m^2. The crank $O2B$ rotates at 100 rad/s. Neglecting gravity effects, determine the forces in the joints and the input torque. [10M]



4. Derive an equation for maximum fluctuation of energy in Flywheel of Punching press? [10M]

OR

5. During forward stroke of piston of double acting steam engine, the turning moment has a maximum value of 2000N-m when crank makes an angle of 80^0 with IDC. During backward stroke, the maximum turning moment is 1500N-m when crank makes an angle of 80^0 with ODC the turning moment diagram for the engine may be assumed for simplicity to be represented by two triangles. If the crank makes 100rpm and radius of gyration of flywheel is 1.75m, find coefficient of fluctuation of energy and mass of flywheel to keep speed within +or -0.75% of mean speed also determine the crank angle at which speed has its minimum and maximum value. [10M]

6. Describe with a neat sketch working of a single plate friction clutch. [10M]

OR

7. Derive the expression for the braking torque of an internal expanding brake [10M]

8. With a neat sketch, explain the working of Wilson-Hartnell governor [10M]

9.a) Why is balancing necessary for rotors of high speed engines? [02M]

b) Four masses A, B, C and D carried by a rotating shaft at radii 80mm,100mm,160mm and 120mm respectively are completely balanced. Masses B, C and D 8kg, 4kg and 3kg respectively. Determine the mass A and the relative angular positions of the four masses if the planes are spaced 500mm apart. [08M]

10. A spring-mass system consists of a spring of stiffness 350 N/m. The mass is 0.35 kg. The mass is displaced 20 mm beyond the equilibrium position and released. The damping coefficient is 14 N.s/m. Determine (a) critical damping coefficient, (b) damped natural frequency, and (c) logarithmic decrement. [10M]

OR

11. Derive an equation for the transverse vibration of a uniformly loaded shaft. [10M]

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