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

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Supply) – December 2024
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)	Define D'Alemberts principle.	[2M]
b)	Define gyroscopic couple effect.	[2M]
c)	outline the functions of a flywheel.	[2M]
d)	Define 'inertia force' and 'inertia torque'.	[2M]
e)	Write a short note on boundary friction.	[2M]
f)	Distinguish between clutch and brake.	[2M]
g)	State the function of governor.	[2M]
h)	State the reason why the reciprocating masses are partially balanced.	[2M]
i)	Write a short note on torsional vibration.	[2M]
j)	Explain the term whirling speed.	[2M]

PART-B **(50 Marks)**

2. Explain the effect of gyroscopic couple on aeroplane and naval ships. [10M]

OR

3. A connecting rod is suspended from a point 25 mm above the centre of small end, and 650 mm above its centre of gravity, its mass being 37.5 kg. When permitted to oscillate, the time period is found to be 1.87 seconds. Find the dynamical equivalent system constituted of two masses, one of which is located at the small end centre. [10M]

4. The turning moment diagram for a multi-cylinder engine has been drawn to a scale 1mm = 600 N-m vertically and 1mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as follows :+ 52, – 124, + 92, – 140, + 85, – 72 and + 107 mm^2, when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed ± 1.5% of the mean, find the necessary mass of the flywheel of radius 0.5 m. [10M]

OR

5. An engine flywheel has a mass of 6.5 tones and the radius of gyration is 2m. If the maximum and minimum speeds are 120 rpm and 118 rpm respectively. Determine maximum fluctuation of energy. [10M]

6. A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm^2. If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500 r.p.m. [10M]

OR

7. Explain briefly the uniform pressure theory as applicable to friction clutches and brakes. [10M]

8. A Porter governor has all four arms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and the sleeve has a mass of 50 kg. The extreme radii of rotation are 150 mm and 200 mm. Determine the range of speed of the governor. [10M]

OR

9. A shaft carries four rotating masses A, B, C, D which are completely balanced. The masses B and C are 40kg, 28kg and both are at 160 mm radius. While the masses A and D are at 200 mm radius. Angle between B and C 100^0, B and A is 190^0, both angles being measured in the same sense. The planes A and B are 250 mm apart, B and C 500 mm apart. Determine: (i) The mass A and D and angular position of D. (ii) Distance between planes C and D. [10M]

10. Derive the expression for free torsional vibrations for two rotor and three rotor system. [10M]

OR

11. Shaft of diameter 40mm and 2.5m long has a mass of 15kg/m. It is simply supported at ends and carries three masses 90kg, 140kg, 60kg at 0.8m, 1.5m, 2m respectively from the left support. Evaluate the frequency of transverse vibration by using dunkerley's method. Take E= 200G N/m^2. [10M]

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