Code No. : 15545 S N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
Accredited by NAAC with A++ Grade
B.E. (Mech. Engg.) V-Semester Supplementary Examinations, June-2023
Dynamics of Machines

Time: **3 hours**

Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question.	M	L	CO	PO
1.	Define 'inertia force' and 'inertia torque',	2	1	1	1
2.	Explain the application of gyroscopic principles to aircrafts.	2	2	1	2
3.	Why is balancing of rotating parts necessary for high speed engines?	2	1	2	1
4.	Write a short note on primary and secondary balancing.	2	1	2	2
5.	Discuss briefly the various types of friction experienced by a body	2	2	3	2
6.	What are the leading and trailing shoes of an internal expanding shoe brake?	2	1	3	1
7.	What is the function of a governor?	2	1	4	1
8.	Draw the turning moment diagram of a single cylinder double acting steam engine.	2	1	4	2
9.	Sketch the longitudinal, transverse and torsional free vibrations.	2	1	5	1
10.	What is the natural frequency of free torsional vibrations?	2	1	5	2

Part-B (5×8 = 40 Marks)

11. a)	The crank and connecting rod of a steam engine are 0.3 m and 1.5 m in length. The crank rotates at 180 rpm clockwise. Determine Piston effort and crank effort when the crank is at 40 degrees from the inner dead center position.	4	2	1	3
b)	Discuss the stability of four wheeler by considering gravity, centrifugal and gyroscopic effects.	4	2	1	1
12.	A shaft with 3 meters span between two bearings carries two masses of 10 kg and 20 kg acting at the extremities of the arms 0.45 m and 0.6 m long respectively. The planes in which these masses rotate are 1.2 m and 2.4 m respectively from the left end bearing supporting the shaft. The angle between the arms is 60°. The speed of rotation of the shaft is 200 rpm. If the masses are balanced by two counter-masses rotating with the shaft acting at radii of 0.3 m and placed at 0.3 m from each bearing centers, estimate the magnitude of the two balance masses and their orientation with respect to the X-axis, i.e. mass of 10 kg.	8	3	2	3

		M	L	CO	PO
13. a)	A conical pivot supports a load of 20 kN, the cone angle is 120° and the intensity of normal pressure is not to exceed 0.3 N/mm². The external diameter is twice the internal diameter. Find the outer and inner radii of the bearing surface. If the shaft rotates at 200 rpm and the coefficient of friction is 0.1, find the power absorbed in friction. Assume uniform pressure.	4	3	3	3
b)	Explain the Rope brake dynamometer with a neat sketch.	4	2	3	1
14. a)	A Porter governor has links 150 mm long and are attached to pivots at a radial distance of 30 mm from the vertical axis of the governor. The mass of each ball is 1.75 kg and the mass of the sleeve is 25 kg. The governor sleeve begins to rise at 300 rpm when the links are at 30° to the vertical. Assuming the friction force to be constant, find the minimum and maximum speed of rotation when the inclination of the links is 45° to the vertical.	4	3	4	3
b)	Discuss the procedure to find the maximum fluctuation of energy of flywheel in a multi cylinder engine.	4	2	4	1
15. a)	Discuss the damped free longitudinal vibrations.	4	2	5	2
b)	A shaft 50 mm diameter and 3 meters long is simply supported at the ends and carries a central point load of 1000 N. The Young's modulus for shaft material is 200 GN/m². Find the frequency of transverse vibration.	4	4	5	3
16. a)	The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 rpm clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship, when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h.	4	3	1	3
b)	Explain the balancing of rotating masses in various planes.	4	2	2	1
17.	Answer any *two* of the following:				
a)	Explain the working of single plate clutch with a neat sketch.	4	3	3	1
b)	Discuss the controlling force curves in governors.	4	3	4	2
c)	Define the whirling speed of shaft and develop the equation for it.	4	2	5	1

M : Marks;   L: Bloom's Taxonomy Level;   CO; Course Outcome;   PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

*****