R18 Regulation *Subject code:2P4CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, June 2026

DYNAMICS OF MACHINERY

(ME)

Maximum Marks: 70 Date: 08.06.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Discuss Precesional angular motion.	2M	1	L1
2	Define right hand screw rule.	2M	1	L1
3	Define the clutch.	2M	2	L1
4	What is the difference between brake and Dynamometer?	2M	2	L1
5	What is meant by fluctuation of Energy?	2M	3	L1
6	Classify governors.	2M	3	L1
7	State why is balancing of rotating parts necessary for high speed engines.	2M	4	L1
8	Describe are in-line engines? How are they balanced?	2M	4	L1
9	Derive an expression for the natural frequency of free transverse vibrations for a simply supported	2M	5	L1
10	Explain the terms 'under damping, critical damping' and 'over damping'.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	The turbine rotor of a ship has a mass of 20 tones & a radius of gyration of 0.75m.Its speed is 2000 rpm. the ship pitches 6degrees above & below the horizontal position. One complete oscillation takes 18 sec & the motion is simple harmonic. Determine: (i)The maximum couple tending to shear the holding down bolts of the turbine. (ii)The maximum angular acceleration of the ship during pitching . (iii)The direction in which the bow will tend to turn while rising, if the rotation the rotor is clock wise when looking from rear.	10M	1	L2
	OR			
12	Describe, in detail, the complete static force analysis of the system of a reciprocating engine mechanism.	10M	1	L2
13	Briefly explain about watts and porter governor.	10M	2	L2
	OR			
14	Explain different types of brakes.	10M	2	L2
15	The turning moment diagram of a multi cylinder engine is drawn to the following scales: Turning moment, 1mm = 500 N-m vertically;& 1mm = 35 horizontally, The intercepted areas between the output torque curve & the mean	10M	3	L2

	resistance line, taken in order from one end, are as follows : +53,-125,+93, -142, + 86, -73 & +108 mm^2. When the engine is running at a speed of 600 rpm. If the total fluctuation of speed is not to exceed± 1.6 % of the mean, Calculate the necessary mass of the flywheel of radius 0.6 m.			
	OR			
16	The Flywheel of a steam engine has a radius of gyration of 1 m and a mass of 2500 kg. The starting torque of the steam engine is 1500 N-m and may be assumed constant. Determine the i. Angular acceleration of the Fly wheel, and ii. The kinetic energy of the wheel after 10 seconds from the start.	10M	3	L2
17	A rotating shaft carries four unbalanced masses 18 kg, 14 kg, 16 kg and 12 kg at radii 50 mm, 60 mm, 70 mm and 60 mm respectively. The 2nd, 3rd and 4th masses revolve in planes 80 mm, 160mm and 280 mm respectively measured from the plane of the first mass and are angularly located at 60°, 135° and 270° respectively measured clockwise from the first mass looking from this mass end of the shaft. The shaft is dynamically balanced by two masses, both located at 50 mm radii and revolving in planes mid-way between those of 1st and 2nd masses and midway between those of 3rd and 4th masses. Determine, graphically or otherwise, the magnitudes of the masses and their respective angular positions.	10M	4	L2
	OR			
18	A single cylinder engine runs at 250 r.p.m. and has a stroke of 180 mm. The reciprocating parts has a mass of 120 kg and the revolving parts are equivalent to a mass of 70 kg at a radius of 90 mm. A mass is placed opposite to the crank at a radius of 150 mm to balance the whole of the revolving mass and two-thirds of the reciprocating mass. Determine the magnitude of the balancing mass and the resultant residual unbalance force when the crank has turned 30° from the inner dead centre, neglect the obliquity of the connecting rod.	10M	4	L2
19	A coil of spring sti_ness 60 N/mm supports vertically a load of 3 kN at the free end. The motion is resisted by the oil dashpot. It is found that the amplitude at the beginning of the fourth cycle is 0.6 times the amplitude of the previous vibration. Find the ratio of the frequencies of damped and undamped vibrations.	10M	5	L2
	OR			
20	Derive an expression for the frequency of free torsional vibrations for a shaft fixed at one end and carrying a load on the free end.	10M	5	L2