R20 Regulation *Subject code: 3P5CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, April 2026

DYNAMICS OF MACHINERY

(ME)

Maximum Marks: 70 Date: 15.04.2026 Duration: 3 hours

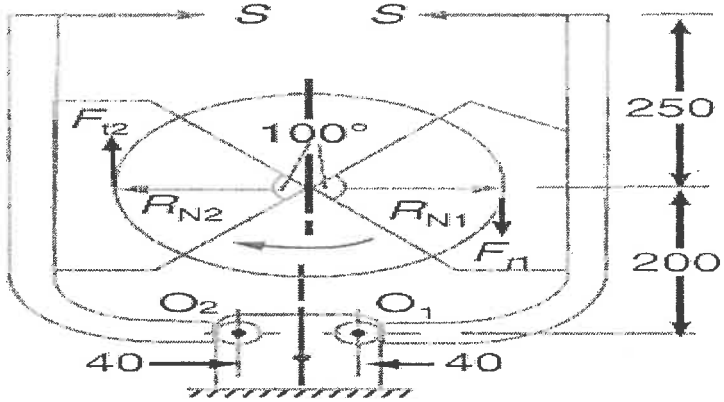
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

	All the following questions carry equal marks (10X2M=20 Marks)	Marks	CO	BTL
1	What is meant by Gyroscope Couple?	2M	1	L1
2	What are the conditions for equilibrium of Three force member?	2M	1	L1
3	What is the function of a 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	What do you mean by coupled locomotives and uncoupled locomotives?	2M	4	L1
8	What is Tractive force?	2M	4	L1
9	What are different types of Vibrations?	2M	5	L1
10	What is meant by Whirling of shafts?	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 10 tonnes & a radius of gyration of 0.6m.It rotates at 1900 rpm. Clockwise, when looking from the front of the stern. Determine the Gyroscopic couple, if the ship travels at 120km/h and steers to the left in a curve of 75m radius.	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	A single plate clutch (both sides effective) is required to transmit 36.5 kWat 1800 rpm. The outer diameter of the plate is limited to 250 mm, and the intensity of pressure between the plates is not to exceed 68.5kN/m2. Assuming uniform wear and a coefficient of friction of 0.3, show that the inner diameter of the plate is approximately 90 mm.	10M	2	L2
	OR			

14	A double shoe brake, as shown in Fig. is capable of absorbing a torque of 1400 N-m. The diameter of the brake drum is 350 mm and the angle of contact for each shoe is 100°. If the coefficient of friction between the brake drum and lining is 0.4 ; find **1.** the spring force necessary to set the brake ; and **2.** The width of the brake shoes, if the bearing pressure on the lining material is not to exceed 0.3 N/mm2.  **All dimensions in mm**	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 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.	10M	3	L2
	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 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
	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	10M	4	L2

	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.			
19	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
	OR			
20	A shaft 50 mm diameter and 3 meters long is simply supported at the ends and carries three loads of *1000 N,* and *1500 N* and *750 N* at 1 m, 2 m and 2.5 m from the left support. The young's modulus for shaft material is 200 GN/m^2. Calculate the frequency of transverse vibration.	10M	5	L2