



R18 Regulation

Subject code:2P4CA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, December 2025

DYNAMICS OF MACHINERY

(ME)

Maximum Marks: 70

Date:16.12.2025

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	Write about working of single plate clutch.	2M	2	L1
5	What is meant by fluctuation of Energy?	2M	3	L1
6	Draw the turning moment diagram of a single cylinder double acting steam engine?	2M	3	L1
7	State why is balancing of rotating parts necessary for high-speed engines.	2M	4	L1
8	What are in-line engines?	2M	4	L1
9	Write the causes and effects 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	Explain what you understand by gyroscopic stabilization. Illustrate with the help of a sketch how this is carried out in ships. The turbine rotor of a ship has a mass of 8 tones and a radius of gyration 0.6 m. It rotates at 1800 r.p.m. clockwise, when looking from the stern. Determine the gyroscopic couple, if the ship travels at 100 km/hr and steer to the left in a curve of 75 m 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 26.5 KW at 1600 rpm. The outer diameter of the plate is limited to 300 mm, and the intensity of pressure between the plates is not to exceed 68.5kN/m ² . 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	Explain clutches in detail with diagrams.	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 $\pm 1.6\%$ 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	Four masses m ₁ , m ₂ , m ₃ and m ₄ are 200 kg, 300 kg, 240 kg, and 260 kg respectively. The corresponding radii of rotation are 0.2m, 0.15m, 0.25m and 0.3m respectively and the angles between successive masses are 45-degree, 35 degree and 135 degree. Calculate the position and magnitude of the balance mass required, if its radius of the rotation is 0.2m	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 beam of length 10 m carries two loads of mass 200 kg at distances of 3m from each end together with a central load of mass 1000 kg. Calculate the frequency of transverse vibrations. Neglect the mass of the beam and take $I = 10^9 \text{ mm}^4$ and $E = 20^5 \times 10^3 \text{ N/mm}^2$.	10M	5	L2
OR				
20	A steel bar 25 mm wide and 50 mm deep is freely supported at two points 1 m apart and carries a mass of 200 kg in the middle of the bar. Neglecting the mass of the bar, Calculate the frequency of transverse vibration. If an additional mass of 200 kg is distributed uniformly over the length of the shaft, what will be the frequency of vibration? Take $E = 200 \text{ GN/m}^2$.	10M	5	L2