



R20 Regulation

Subject code: 3P5CA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, November 2025

DYNAMICS OF MACHINERY

(ME)

Maximum Marks: 70

Date: 18.11.2025

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	Write the effect of reactive gyroscopic couple when a naval ship is rolling?	2M	1	L1
2	What is the gyroscopic effect on an aeroplane.	2M	1	L1
3	List the various types of mechanical brakes.	2M	2	L1
4	Write the various types of transmission Dynamometers.	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? How are they balanced?	2M	4	L1
9	Define natural frequency.	2M	5	L1
10	Define free vibrations and forced vibrations.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	An aeroplane makes a complete half circle of 50 meters radius, towards left, when flying at 200 kmph. The rotary engine and the propeller of the plane has a mass of 400 kg. and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Calculate the gyroscopic couple on the aircraft and state its effect on it.	10M	1	L2
OR				
12	A four wheeled motor car of mass 2000 kg has a wheel base 2.5 m, track width 1.5 m and height of center of gravity 500 mm above the ground level and lies at 1 meter from the front axle. Each wheel has an an effective diameter of 0.8 m and a moment of inertia of 0.8 kg-m ² . The drive shaft, Engine flywheel and transmission are rotating at 4 times the speed of road wheel, in a clockwise direction when viewed from the front, and is equivalent to a mass of 75 kg having a radius of gyration of 100 mm. If the	10M	1	L2

	car is taking a right turn of 60 m radius at 60 km/h, Calculate the load on each wheel.			
13	A truck has 3.15 m wheel base & the C.G. is 1.28 m in front of the rear axle & 0.9 m above ground level. The co efficient of adhesion between tyres& road is 0.6 & the brakes are applied to the rear wheels only. Calculate the minimum distance in which the truck can be stopped on a level road when travelling at 48 kmph? If the weight of the truck is 8 tones, find the pressure on each wheel during braking?	10M	2	L2
	OR			
14	A single plate clutch is required to transmit 26.5 KW at 1600 rpm. The outer diameter of the plate is limited to 300 mm & intensity of the pressure between the plates is not exceeds 68.5 KN/m ² Assuming uniform wear & co-efficient of friction is μ is 0.3, show that the inner diameter of the plate is approximately 90 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 \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 postion 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	10M	4	L2

	when the crank has turned 30° from the inner dead centre, neglect the obliquity of the connecting rod.			
19	A mass of 5 kg is supported by a spring of stiffness 5 kN/m. In addition, the motion of mass is by a damper whose resistance is proportional to velocity. The amplitude of vibration reduces to 1/15th of the initial amplitude in four complete cycles. Determine the damping force per unit velocity and the ratio of the frequencies of the damped and undamped vibrations.	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

