



R20 Regulation

Subject code:3P5CA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, December 2024

DYNAMICS OF MACHINERY

(ME)

Maximum Marks: 70

Date:23.12.2024

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 which carries 10M.
 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)		CO	Bloom Tx
1	State the D' Alembert's principle for Rectilinear motion.	1	L1
2	What do you understand by spin, precession and gyroscopic planes?	1	L1
3	What do you understand by 'self-locking brake' and 'self-energized brake'?	2	L1
4	Write the uses of turning moment diagram of reciprocating engines.	2	L1
5	Distinguish between brakes and dynamometers.	3	L1
6	Discuss the various types of the brakes.	3	L1
7	Write about 'coefficient of insensitiveness' of governors.	4	L1
8	Define the Isochronism and Hunting.	4	L1
9	Write about Denkerly's method?	5	L1
10	Define frequency, cycle, period and free vibration.	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	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 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: 1. when the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h. 2. when the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees. [10M]	1	L2
OR			
12	An aero plane makes a half circle of 100 m radius towards when flying at 400 kmph. The engine and propeller of plane weigh 500 kg, and have a radius of gyration of 30 cm. The engine rotates at 3000 rpm ccw, when viewed from the front end. Find the gyroscopic couple [10M]	1	L2
13	The turning moment diagram for a petrol engine is drawn to the following scales : Turning moment, 1 mm = 5 N-m ; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line	2	L2

	taken in order are 295, 685, 40, 340, 960, 270 mm ² . The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m [10M]		
	OR		
14	In a turning moment diagram, the areas above and below the mean torque line taken in order are 4400, 1150, 1300, and 4550mm ² respectively. The scales of the turning moment diagram are: Turning moment: 1 mm = 100 N – m; Crank angle: 1mm 10°. Find the mass of the flywheel required to keep the speed between 297 and 303 rpm, if the radius of the gyration is 0.525 m [10M]	2	L2
15	Which of the two assumptions, uniform intensity of pressure or uniform rate of wear, will you make use of in designing a friction clutch, and why? Give reason. [10M]	3	L2
	OR		
16	A multi-disc clutch has 5 plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed 127 kN/m ² , find the power in kW transmitted at 500 rpm, if the outer and inner radii of friction surfaces are 1.25 mm and 75 mm respectively. Assume uniform wear and take coefficient of friction as 0.3. [10M]	3	L2
17	Four masses A, B, C and D revolves at equal radii and equally spaced along a shaft. The mass B is 7kg and the radii of C and D make angle s of 90° and 240° respectively with the radius of B. Find the Magnitude of masses A, C and D and angular position of A, so that the system may be completely balanced [10M]	4	L2
	OR		
18	A Porter governor has equal arms 200 mm long pivoted on the axis of rotation. The mass of each ball is 3 kg and the mass on the sleeve is 15 kg. The ball path is 120 mm when the governor begins to lift and 160 mm at the maximum speed. Determine the range of speed. If the friction at the sleeve is equivalent to a force of 10N, find the coefficient of insensitiveness. [10M]	4	L2
19	Distinguish the longitudinal, transverse and torsional free vibrations. [10M]	5	L2
	OR		
20	Describe, with relevant sketches, the Equilibrium method to find the natural frequency of free longitudinal vibrations. [10M]	5	L2