R20 Regulation *Subject code: 3P5CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, July 2024

Dynamics of Machinery

(Mechanical Engineering)

Maximum Marks: 70 Date:19.07.2024 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.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A	CO	Bloom Tx
All the following questions carry equal marks	(10x2M=20 Marks)		
1	Write the gyroscopic effect to aircraft?	1	L1
2	What is D Alembert's principle in dynamic force analysis?	1	L1
3	Differentiate inertia force and inertia torque?	2	L1
4	What are the requirements of an equivalent dynamic system?	2	L1
5	Draw a neat sketches of single plate friction clutch and centrifugal clutch?	3	L1
6	Explain the functions of absorption and transmission dynamometers?	3	L1
7	Write expression for effort and power of a Porter Governor?	4	L1
8	How the different masses rotating in different planes are balanced?	4	L1
9	Define the terms whirling speed and critical speed.	5	L1
10	What do you mean by torsional vibrations?	5	L1
	Part-B		
Answer All the following questions.	(5X10M=50Marks)		Bloom Tx level
11	Explain the concept of gyroscopic couple. Derive an equation for its magnitude. [10]	1	L2
	OR		
12	Discuss the dynamic analysis of 4-link mechanism and Slider Crank Mechanism. [10]	1	L2
13	(a) Explain the terms Coefficient of fluctuation of energy and coefficient of fluctuation of speed. [5] (b) The turning moment diagram for a four stroke gas engine may be assumed for simplicity to be represented by four triangles, the areas of which from the line of zero pressure are as follows: Expansion stroke = 3550 mm^2 ; Exhaust stroke = 500 mm^2 ; Suction stroke = 350 mm2 ; and compression stroke = 1400 mm^2 . each mm2 represents 3 N-m. Assuming the resisting moment to be uniform, find the mass of the rim of a fly wheel required to keep the mean speed 200 rpm within ±2%. The mean radius of the rim may be taken as 0.75 m. Also determine the crank positions for the maximum and minimum speeds. [5]	2	L2

	OR		
14	Deduce an expression for the inertia force in the reciprocating parts, neglecting weight of the connecting rod? [10]	2	L2
15	A conical pivot bearing 150 mm in diameter has a cone angle of 120^0 . If the shaft supports an axial load of 20 kN and the coefficient of friction is 0.03, find the power lost in friction when the shaft rotates at 200 rpm, assuming uniform pressure and uniform wear. [10]	3	L2
	OR		
16	A simple band brake is operated by lever of length 500mm . The brake drum has a dimeter of 500mm and the brake band embraces 5/8 of the circumference. One end of the band is attached to the fulcrum of the lever while the other lever while the other end is attached to a fin on the lever 100mm from the fulcrum. If the effort is applied to the end of the lever is 2 Kn and coefficient of friction is 0.25, find the maximum braking torque on the drum. [10]	3	L2
17	(a) Explain the concepts of Controlling Force and Hunting in governors. [5] (b) The lengths of the upper and lower arms of a porter governor are 200mm and 250mm respectively. Both the arms are pivoted on the axis of rotation. The central load is 150N, the weight of each ball is 20N and the friction of the sleeve together with the resistance of the operating gear is equivalent to a force of 30N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40° taking friction into account. Find the range of speed of the governor. [5]	4	L2
	OR		
18	Explain the method of balancing of different masses revolving in the same plane. [10]	4	L2
19	Derive an equation for the natural frequency of free transverse vibration of a shaft headed with a number of concentrated loads, by energy method. [10]	5	L2
	OR		
20	(a) Explain the terms Under damping, critical damping and over damping. [5] (b) A shaft is simply supported at the ends and is of 20 mm is diameter and 600 mm is length. The shaft carries a load of 19.62 N at its center. The weight of the shaft per meter length is 250 N. Find the critical speed of the shaft. Take E = 200 GN / m^2 . [5]	5	L2