



Regulation R18
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, February 2024

DYNAMICS OF MACHINERY

(Mechanical Engineering)

Maximum Marks: 70

Date: 16.02.2024 Duration: 3 Hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 10 questions. Answer any 5 questions which carries 12M.
 4. Each question carries 12 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	Write the Precesional angular motion?	1	L2
2	Define right hand screw rule	1	L2
3	Define the clutch	2	L2
4	Briefly explain about working of single plate clutch	2	L3
5	Define coefficient of fluctuation of speed	3	L2
6	Describe the function of flywheel	3	L2
7	State why is balancing of rotating parts necessary for high speed engines ?	4	L3
8	Describe what are in-line engines ? How are they balanced ? It is possible to balance them completely ?	4	L3
9	Discuss the causes and effects of vibrations ?	5	L2
10	What is meant by Whirling of shafts?	5	L2

Part-B

Answer ANY FIVE QUESTIONS (10MX 5=50Marks)			
11	The turbine rotor of a ship has a mass of 20 tones & a radius of gyration of 0.75m. Its speed is 2000 rpm. the ship pitches 6 degrees above & below the horizontal position. One complete oscillation takes 18 sec & the motion is simple harmonic. Determine (i) The maximum couple tending to shear the holding down bolts of the turbine. (ii) The maximum angular acceleration of the ship during pitching . (iii) The direction in which the bow will tend to turn while rising, if the rotation the rotor is clock wise when looking from rear. [10]	1	L4
OR			
12	The lead screw of the lathe has acme threads of 50 mm outside diameter and 10 mm pitch. The included angle of thread is 29 degrees. It drives a tool carriage and exerts a pressure of 2500N. A collar bearing with outside diameter 100mm and inside diameter 50mm is provided to take up the thrust. If the lead screw rotates at 30 r.p.m. and calculate the efficiency and the power required to drive the screw. The coefficient of friction for the screw threads is 0.15 and for the collar is 0.12.	1	L3

	[10]		
13	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. [10]	2	L3
	OR		
14	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. [10]	2	L4
15	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. [10]	3	L4
	OR		
16	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. [10]	3	L4
17	A,B,C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B,C and D are 10 kg, 5 kg and 4 kg respectively. Calculate the required mass a and the relative angular settings of the four masses so that the shaft shall be in complete balance. [10]	4	L3
	OR		
18	A beam of length 10 m carries two loads of mass 200 kg at distances of 3 m 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 $I = 109 \text{ mm}^4$ and $E = 205 \times 10^3 \text{ N/mm}^2$. [10]	4	L3
19	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 $E = 200 \text{ GN/m}^2$. [10]	5	L3
	OR		
20	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. [10]	5	L4