R20 Regulation *Subject code:3P5CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, May 2025

DYNAMICS OF MACHINERY

(ME)

Maximum Marks: 70 Date: 17.06.2025 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	Briefly explain about working of single plate clutch	2M	2	L1
5	Define coefficient of fluctuation of speed	2M	3	L1
6	Write the function of flywheel	2M	3	L1
7	How a single revolving mass is balanced by two masses revolving in different planes.	2M	4	L1
8	How the different masses rotating in different planes are balanced.	2M	4	L1
9	Write an expression for the natural frequency of free transverse vibrations for a simply supported.	2M	5	L1
10	Define, in short, free vibrations, forced vibrations and damped vibrations.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	The turbine rotor of a ship has a mass of 10 tonnes & a radius of gyration of 0.6m and it rotates at 1900 rpm. Clockwise, when looking from the front the stern. Determine the Gyroscopic couple, if the ship travels at 120km/h and steers to the left in a curve of 75m 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 36.5 kWat 1800 rpm. The outer diameter of the plate is limited to 250 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	A band brake acts o he 3/4th of circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provided a braking torque of 225 N-m. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating	10M	2	L2

	force is applied at 500 mm from the fulcrum and the coefficient of friction is 0.25, calculate the operating force when the drum rotates in (a) anti0clockwise, and (b) clockwise direction.			
15	The turning moment diagram of a petrol engine is drawn to the following scales: Turning moment, 1mm = 5 N-m; crank angle, 1 mm = 1^0. The turning moment diagram repeats itself at every half revolution of the engine & the areas above & below the mean turning moment line taken in order are 295, 685,40, 340, 960,270 mm^2 . The rotating parts are equivalent to a mass of 36 kg at the radius of gyration of 150 mm. Determine the co efficient of fluctuation of speed when the engine runs at 1800 rpm.	10M	3	L2
	OR			
16	The turning moment diagram of a multi cylinder engine is drawn to the following scales: Turning moment, 1mm = 600 N-m vertically;& 1mm = 30 horizontally, The intercepted areas between the output torque curve & the mean resistance line, taken in order from one end, are as follows : +52 -124, +92, -140, + 85, -72 & +107 mm^2. When the engine is running at a speed of 600 rpm. If the total fluctuation of speed is not to exceed± 1.5 % of the mean, Calculate the necessary mass of the flywheel of radius 0.5 m.	10M	3	L2
17	A,B,C and D are four masses carried by a rotating shaft at radii 100 mm, 150 mm ,150mm and 200mm respectively. The planes in which the masses rotate are spaced at 500mm apart and the magnitude of the masses B,C and D are 9kg,5 kg and 4 kg respectively. Calculate the required mass A and the relative angular settings for the four masses so that the shaft shall in complete balance.	10M	4	L2
	OR			
18	A shaft carrier five masses A,B,C,D and E which revolves at the same radius in planes which are equidistant from one another. The magnitude of the masses in planes A, C and D are 50 kg, 40 kg and 80 kg respectively. The angle between A and C and that between C and D is 135 degrees. Determine the magnitude the masses in planes Band E and their position to put the shaft in complete rotating balance.	10M	4	L2
19	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 mm4 and $E = 205 \times 103$ N/mm^2 .	10M	5	L2
	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.	10M	5	L2