



R18 Regulation

Subject code: 2P4CA

## TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

**B.Tech IV Semester Supplementary Examinations, September 2023**

### Dynamics of Machinery

(ME)

**Maximum Marks: 70**

Date: 13.09.2023 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)

- 1 Define Precessional angular motion.
- 2 What are the conditions for equilibrium of Three force member?
- 3 Define the clutch.
- 4 Discuss the various types of transmission Dynamometers.
- 5 Define coefficient of fluctuation of speed
- 6 Describe the function of flywheel
- 7 State why is balancing of rotating parts necessary for high-speed engines.
- 8 Explain how the different masses rotating in different planes are balanced?
- 9 Discuss the causes and effects of vibrations?
- 10 What is meant by Whirling of shafts?

#### Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Explain what you understand by gyroscopic stabilization. Illustrate with the help of a sketch how this is carried out in ships. The turbine rotor of a ship has a mass of 8 tones and a radius of gyration 0.6 m. It rotates at 1800 r.p.m. clockwise, when looking from the stern. Determine the gyroscopic couple, if the ship travels at 100 km/hr and steer to the left in a curve of 75 m radius.

(10M)

OR

- 12 Describe, in detail, the complete static force analysis of the system of a reciprocating engine mechanism.

(10M)

- 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 coefficient 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)

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<sup>2</sup> Assuming uniform wear & co-efficient of friction is  $\mu$  is 0.3, show that the inner diameter of the plate is approximately 90 mm (10M)

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°. 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<sup>2</sup> . 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)

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)

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 position and magnitude of the balance mass required, if its radius of the rotation is 0.2m (10M)

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)

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  $I = 109 \text{ mm}^4$  and  $E = 205 \times 10^3 \text{ N/mm}^2$ . (10M)

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)