



Regulation R18

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, July 2022

DYNAMICS OF MACHINERY

(Mechanical Engineering)

Subject code: 2P4CA

Maximum Marks: 70

Date: 20.07.2022 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)

- 1 Discuss Precessional angular motion
- 2 Define right hand screw rule
- 3 Define the clutch
- 4 Briefly explain about working of single plate clutch
- 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 What are in-line engines?
- 9 Discuss the causes and effects of vibrations?
- 10 What is meant by Whirling of shafts?

Part-B

Answer all the questions

(10MX 5=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. [10]

OR

- 12 Describe, in detail, the complete static force analysis of the system of a reciprocating engine mechanism. [10]
- 13 A single plate clutch (both sides effective) is required to transmit 26.5 KW at 1600 rpm. The outer diameter of the plate is limited to 300 mm, and the intensity of pressure between the plates is not to exceed 68.5kN/m². Assuming uniform wear and a coefficient of friction of 0.3, show that the inner diameter of the plate is approximately 90 mm. [10]

OR

- 14 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 mm². The rotating parts are equivalent to a mass of 36 kg at the radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 rpm. [10]

- 15 The turning moment diagram of a multi cylinder engine is drawn to the following scales: Turning moment, $1\text{mm} = 600\text{ N}\cdot\text{m}$ vertically; & $1\text{mm} = 30$ 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 & $+107\text{ mm}^2$. When the engine is running at a speed of 600 rpm . If the total fluctuation of speed is not to exceed $\pm 1.5\%$ of the mean, Calculate the necessary mass of the flywheel of radius 0.5 m . [10]

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° , 35° and 135° . Calculate the position and magnitude of the balance mass required, if its radius of the rotation is 0.2m . [10]

- 17 A shaft carries 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° . Determine the magnitude of the masses in planes B and E and their position to put the shaft in complete rotating balance. [10]

OR

- 18 A mass of 5 kg is supported by a spring of stiffness 5 Kn/m . In addition, the motion of mass is damped by a damper whose resistance is proportional to velocity. The amplitude of vibration reduces to $1/15^{\text{th}}$ of the initial amplitude in four complete cycles. Determine the damping force per unit velocity and the ratio of the frequencies of the damped and undamped vibrations. [10]

- 19 A shaft 50 mm diameter and 3 meters long is simply supported at the ends and carries three loads of 1000 N , 1500 N and 750 N at 1 m , 2 m and 2.5 m from the left support. The young's modulus for shaft material is 200 GN/m^2 . Calculate the frequency of transverse vibration. [10]

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]