Code No: 134AU **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, September/October - 2023
DYNAMICS OF MACHINERY
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) Define D'Alembert's principle. [2]
b) Explain the gyroscopic effect in aero planes. [3]
c) What is meant by piston effort and crank effort? [2]
d) What do you mean by turning moment diagram? Explain. [3]
e) Explain the friction circle and friction axis? [2]
f) What is a brake? What is the difference between brake and clutch? [3]
g) Describe the function of simple watt governor. What are its limitations? [2]
h) Why is balancing is necessary for rotors of high speed engines? [3]
i) What are the basic elements of vibratory system? [2]
j) Differentiate among the under damping, critical damping and over damping? [3]

PART – B

(50 Marks)

2. What is the condition to design the four-wheeler to maintain the stability? Derive the expression with a neat sketch. [10]

OR

3. Determine the couple T acting on the link 2 to maintain the static equilibrium of the slider crank mechanism subjected to forces as shown in Figure 1. The link lengths are AB=300mm, BC=455mm, BE=175mm. [10]

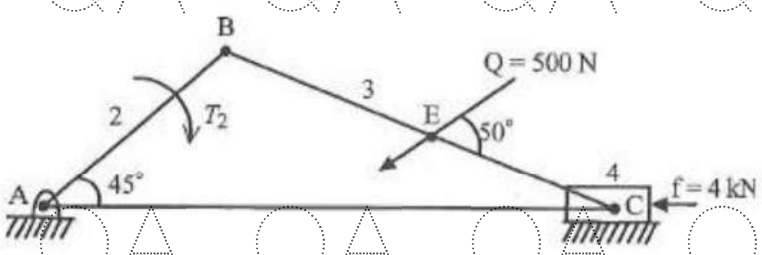

Figure 1

4. The turning moment diagram for a multi-cylinder engine has been drawn to a scale of 1 mm = 325 Nm vertically and 1 mm = 3^0 horizontally. The areas above and below the mean torque line are -26, +378, -256, +306, -302, +244, -380, +261 and -225 mm^2. The engine is running at a mean speed of 600 r.p.m. The total fluctuation of speed is not to exceed +1.8% of the mean speed. If the radius of flywheel is 0.7 m, find the mass of the flywheel.[10]

OR

5. The crank and connecting rod of a vertical petrol engine, running at 1800 rpm are 60 mm and 270m respectively. The diameter of the piston is 100 mm and the mass of the reciprocating parts is 1.2 kg. During the expansion stoke when the crank has turned 20^0 from the top dead centre, the gas pressure is 650 kN/m^2. Determine the
a) Net force on the piston
b) Net load on the gudgeon pin
c) Thrust on the cylinder walls
d) Speed at which the gudgeon pin load is reversed in direction. [10]

6. Derive the expression for uniform pressure theory and uniform wear theory with a neat sketch. [10]

OR

7. The figure 2 shows a simple band brake which applied to a shaft carrying a flywheel of 300 kg mass and of radius of gyration 280 mm. The drum diameter is 220 mm and the shaft speed 240 rpm. The coefficient of friction is 0.3. Find the brake torque when a force of 100 N is applied at the lever end. Also, determine the number of turns of the flywheel and time taken by it before coming to rest. [10]

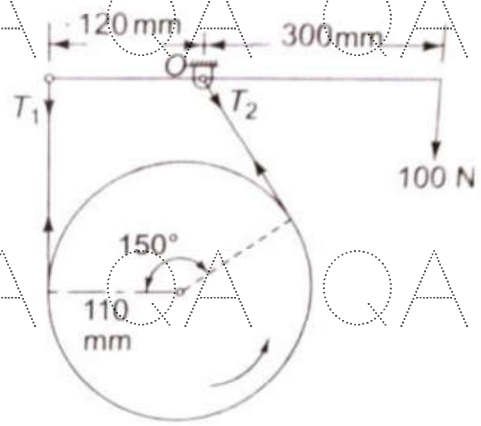

Figure 2

8.a) How do you balance the reciprocating engine?
b) What do you mean by partial balancing in reciprocating engine? [5+5]

OR

9.a) What is power of governor? Derive the expression for power of porter Governor.
b) Differentiate between the watt and porter governor with a neat sketch. [5+5]

10. Derive an equation for the natural frequency of free transverse vibration of a shaft headed with a number of concentrated loads, by Dunkerley's method. [10]

OR

11. Three rotors A, B and C having moment of inertia of 2000, 6000 and 3500 kg m^2 respectively and carried on a uniform shaft of 0.4 m diameter. The length of the shaft between the rotors A and B is 6m and between B and C is 32 m. find the natural frequency of the torsional vibration. The modulus of rigidity for the shaft material is 80 GN/m^2.[10]

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