2/01/2023-FN

Reg. No.												

Question Paper Code	11541

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Fifth Semester

Production Engineering

20PRPC501 - MECHANICS OF MACHINES

(Regulations 2020)

(A3 Sheet should be provided)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Define degree of freedom.	*2,K1,CO1*
2.	Compare machine and structure.	*2,K2,CO1*
3.	State law of gearing.	*2,K1,CO3*
4.	Define circular pitch.	*2,K1,CO3*
5.	Define Co-efficient of friction.	*2,K1,CO4*
6.	What are the functions of clutches?	*2,K1,CO4*
7.	Define Static balancing.	*2,K1,CO5*
8.	What is outside cylinder locomotives?	*2,K1,CO5*
9.	Define Logarithmic Decrement.	*2,K1,CO6*
10.	Define Damping Factor.	*2,K1,CO6*

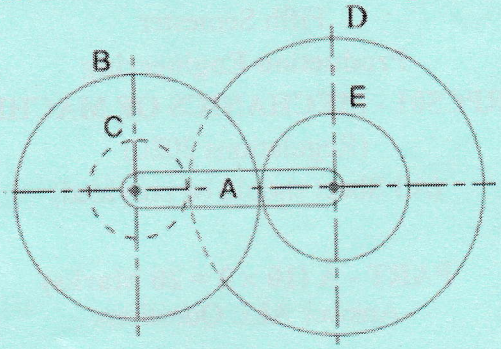
PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Explain the various inversions of four-bar mechanism with a neat sketch.	*13, K2,CO1*
		OR	
	b)	The crank of a slider crank mechanism rotates clockwise at a constant speedof 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine: 1. Linear velocity and acceleration of the midpoint of the connecting rod, and 2. angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position.	*13, K3,CO1*
12.	a)	A pair of 20° full depth involute spur gears having 30 and 50 teeth respectively of module 4mm are in mesh. The smaller gear rotates at 1000r.p.m. Determine: 1. Sliding velocities at engagement and at disengagement of pair of a teeth, and 2. Contact ratio.	*13, K3,CO3*

OR

b) In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D-E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100r.p.m clockwise. *13, K3,CO3*



13. a) A 150 mm diameter valve, against which a steam pressure of2 MN/m^2 is acting, is closed by means of a square threaded screw 50 mm in external diameter with 6 mm pitch. If the coefficient of friction is 0.12; find the torque required to turn the handle. *13, K3,CO4*

OR

b) In a flat belt drive the initial tension is 2000 N. The coefficient of friction between the belt and the pulley is 0.3 and the angle of lap on the smaller pulley is 150°. The smaller pulley has a radius of 200 mm and rotates at 500 r.p.m. Find the power in kW transmitted by the belt *13, K3,CO4*

14. a) A vee-twin engine has the cylinder axes at right angles and the connecting rods operate a common crank. The reciprocating mass per cylinder is 11.5 kg and the crank radius is 75 mm. The length of the connecting rod is 0.3 m. Show that the engine may be balanced for primary forces by means of a revolving balance mass. If the engine speed is 500 r.p.m. What is the value of maximum resultant secondary force? *13, K3,CO5*

OR

b) 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 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. *13, K3,CO5*

15. a) The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a *13, K3,CO6*

velocity of 1 m/s, find : 1. critical damping coefficient, 2. damping factor, 3. Logarithmic decrement, and 4. ratio of two consecutive amplitudes

OR

b) A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m^2. Determine the frequency of longitudinal and transverse vibrations of the shaft *13, K3,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) A cam is to give the following motion to a knife-edged follower: 1. Outstroke during 90° of cam rotation; 2. Dwell for the next 60° of cam rotation; 3. Return stroke during next 60° of cam rotation, and 4. Dwell for the remaining 150° of cam rotation. The stroke of the follower is 40mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis the axis of the follower is offset by 20 mm from the axis of the cam shaft. *15,K3,CO2*

OR

b) A cam with a minimum radius of 25mm, rotating clockwise at a uniform speed is to be designed of give a roller follower, at the end of a valve rod, motion described below: *15,K3,CO2*

1) To raise the valve through 50mm during 120° rotation of the cam;
2) To keep the valve fully raised through next 30°;
3) To lower the valve during next 60°; and
4) To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20mm and the diameter of the cam shaft is 25mm.Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft. The Displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion.