

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024

Theory of Machines

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

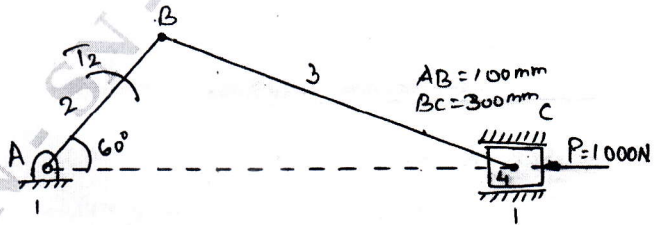
Module – 1			M	L	C
Q.1	a.	Illustrate the working of crank and slotted lever mechanism with suitable figure.	12	L1	CO1
	b.	Define the following: (i) Mechanism (ii) Inversion (iii) Kinematic chain (iv) Degrees of freedom	08	L2	CO1
OR					
Q.2		In a slider crank mechanisms, the crank OB of length 30 mm is inclined at an angle of 60° to the axis and a connecting rod BC of length 120 mm is linked to crank OB. The crank rotates at a uniform speed of 300 rpm clockwise. For the crank position, find: (i) Velocity of piston C and angular velocity of connecting rod BC (ii) Acceleration of piston C and angular acceleration of connecting rod BC	20	L2	CO1
Module – 2					
Q.3	a.	Derive an expression length of arc of contact, length of path of contact and contact ratio.	12	L2	CO2
	b.	In an epicyclic gear train, the arm A is fixed to the shaft S. The wheel B having 100 teeth rotates freely on this shaft S wheel F 150 teeth is separately driven. If the arm A runs at 200 rpm, wheel F at 100 rpm in the same direction. Find : (i) Number of teeth of gear C (ii) Speed of wheel B	08	L2	CO2
OR					
Q.4		A cam rotating clockwise at uniform speed of 300 rpm operates a reciprocating follower through a roller 1.5 cm diameter. The follower motion is defined as below. (i) Outward during 150° with UARM (ii) Dwell for next 30° (iii) Return during next 120° with SHM (iv) Dwell for the remaining period Stroke of the follower is 3 cm. Minimum radius of the cam is 3 cm. Draw the cam profile: a. Follower axis passes through cam axis b. Follower axis is offset to the right by 1 cm	20	L3	CO2
Module – 3					
Q.5		A slider crank mechanism is shown in Fig.Q5. The force applied to the piston is 1000 N when the crank is at 60° from IDC. Calculate the driving torque T_2 . 	20	L2	CO3

Fig.Q5

OR

Q.6		Derive an expression for the various important forces acting on the reciprocating parts of an engine.	20	L3	CO3
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Module – 4

Q.7	a.	Derive an expression for Hoop stress developed in a flywheel.	10	L2	CO4
	b.	During one revolution of the crank of a multicylinder engine the areas above and below the mean turning moment line taken in order are +0.36, -0.81, +0.75, -0.64, +0.92, -0.58 cm ² . The horizontal scale of diagram 1 cm = 45°, vertical scale 1 cm = 7200 Nm, speed of engine = 150 rpm. Total fluctuation of speed 2% of mean speed. Find: (i) Mass of flywheel (ii) Area of cross section of rim. Neglect the effect of arms and bars and take density of rim material as 7260 kg/m ³ and peripheral speed as 1000 m/min.	10	L2	CO4

OR

Q.8	a.	The arms of a porter governor are each 300 mm long and are hinged on the axis of rotation. The mass of each ball is 5 kg. The radius of rotation of the ball is 200 mm when the governor begins to lift and 250 mm at the maximum speed. Determine the maximum and minimum speeds, if the mass of the sleeve is 15 kg. Also find the range of speed if the frictional force at the sleeve is 30 N.	10	L2	CO4
	b.	Derive the expression for stiffness of spring using Hartnell Governor.	10	L2	CO4

Module – 5

Q.9	a.	Explain the various laws of friction.	08	L1	CO4
	b.	A canonical pivot supports a load of 20 kN. The cone angle is 120°. The intensity of uniform pressure is to be 300 kN/m ² and coefficient of friction = 0.03. The external radius is 2 times the internal radius. The speed of the shaft is 120 rpm. Determine the power lost in working against the friction.	12	L2	CO4

OR

Q.10	a.	Derive an expression for the length of an open belt drive.	10	L2	CO4
	b.	With a neat sketch, explain V-belts. Also discuss the advantages and disadvantages of V-belt.	10	L1	CO4
