CBCS SCHEME

USN | | | | | | | | | | |

15AE44

Fourth Semester B.E. Degree Examination, July/August 2022
Mechanism and Machine Theory

Time: 3 hrs. Max. Marks: 80

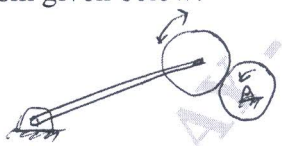
Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define the following terms:
i) Element ii) Higher pair iii) Lower pair iv) Kinematic chain. **(08 Marks)**

b. Determine the mobility of mechanism given below:

Fig.Q.1(b)



(08 Marks)

OR

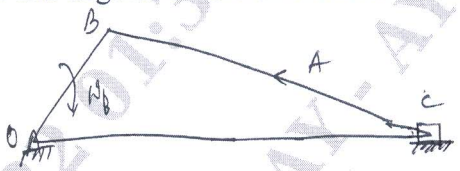
2 a. Sketch and explain the following mechanism:
i) Geneva wheel ii) Ratchet and pawl mechanism. **(08 Marks)**

b. Obtain the condition for correct steering for a four wheeled vehicle. **(08 Marks)**

Module-2

3 a. In a slider crank mechanism the crank OB = 30mm and the connecting rod BC = 120mm. The crank rotates at a uniform speed of 300rpm clock wise for the crank position shown in Fig.Q.3(a). 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. **(08 Marks)**

Fig.Q.3(a)



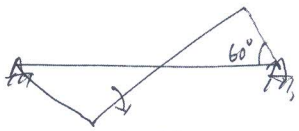
b. A four bar chain ABCD has a fixed link AD = 1m, the driving crank AB = 0.3m, the follower link CD = 0.6m and the connecting link BC = 1.2m. Find the velocity and acceleration of point 'P' mid way between B and C when the angle BAD = 135° and AB rotates clockwise at a speed of 300rpm with an angular acceleration of 20rad/sec^2 in C.C.W. direction. **(08 Marks)**

OR

4 a. Discuss the static equilibrium of
i) Two force ii) Three force mechanism. **(08 Marks)**

b. In four bar mechanism shown in Fig.Q.4(b) torque T_3 and T_4 have magnitudes of 3000Nm and 2000Nm respectively. Take AD = 800mm, AB = 300mm, BC = 700mm and CD = 400mm for static equilibrium of mechanism find the required input torque on the crack. **(08 Marks)**

Fig.Q.4(b)



Module-3

5 a. Obtain the expression for the length of path of contact for two involute profile gear in mesh. **(08 Marks)**

b. Two spur gear have 30 teeth each of involute shape. The circular pitch is 25mm pressure angle 20° determine the addendum of wheels if arc of contact is twice the circular pitch. **(08 Marks)**

OR

6 a. Explain with sketches: i) Compound gear train ii) Epicyclic gear train. **(08 Marks)**

b. Fig.Q.6(b) shows an epicyclic gear train where the arm A the driver and the annular wheel D is the follower the wheel D has 112 teeth and B has 48 teeth. B runs freely on pin P and D is respectively driven. If the arm A runs at 100rpm and wheel D at 50rpm in the same direction find the speed of wheel B and C. **(08 Marks)**

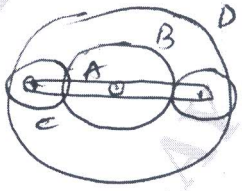


Fig.Q.6(b)

Module-4

7 a. Explain two plane balancing of rotating masses. **(08 Marks)**

b. Four masses m_1, m_2, m_3 and m_4 are 200kg, 300kg, 240kg and 260kg respectively. The corresponding radii of rotation are 0.2m, 0.15m, 0.25m and 0.3m respectively the angle between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required if its radius of rotation is 0.2m. **(08 Marks)**

OR

8 a. Show that for a 90° V-engine the primary forces can be balanced by a single balancing mass. **(08 Marks)**

b. A V-90° engine has two cylinders which are placed symmetrically. The two connecting rods operate a common crank. The length of the connecting rods are 320mm each and crank radius is 80mm. The reciprocating mass per cylinder is 12kg. If the engine speed is 600rpm. Find the resultant primary and secondary forces. Also find the maximum resultant secondary force. **(08 Marks)**

Module-5

9 a. Derive an expression for the height of porter governor. **(08 Marks)**

b. In a spring loaded hartnell governor, the extreme radii of rotation of the balls are 80mm and 120mm. The ball arm and sleeve arm of the bell crank lever are equal in length. The mass of each ball is 2kg. If the speeds at the two extreme positions are 400rpm and 420rpm. Find: i) Initial compression of the central spring ii) Spring stiffness. **(08 Marks)**

OR

10 a. Describe the effect of the gyroscopic couple on an aeroplane. **(08 Marks)**

b. An aeroplane makes a complete half circle of 50m radius towards left when flying at 200km/hr. The mass of the rotary engine and propeller is 400kg with radius of gyration 300mm. The engine runs at 3000rpm counter clockwise when viewed from the rear. Determine the gyroscopic couple and its effect on the aircraft. **(08 Marks)**

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