USN ☐☐☐☐☐☐☐☐☐☐

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Mechanism and Machine Theory

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Distinguish between
   i)   Higher pair and Lower pair
   ii) Mechanism and Machine
   iii) Kinematic pair and Kinematic chain
   iv) Structure and frame   **(10 Marks)**
   b. Explain with the help of neat sketch
   i)   Beam Engine
   ii) Crank and Slotted Lever Mechanism   **(10 Marks)**

OR

2 a. Sketch and explain working of an elliptical trammel and prove that it traces an Ellipse.
                                                                                   (10 Marks)
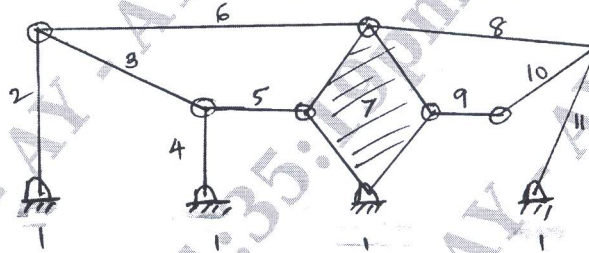   b. Determine the Degree of freedom of the linkage shown in Fig Q2(b).

Fig Q2(b)   **(05 Marks)**
   c. Explain with a neat sketch Robert's mechanism.   **(05 Marks)**

Module-2

3 a. Explain briefly velocity and Acceleration analysis.   **(04 Marks)**
   b. For a 4 – bar mechanism shown in Fig Q3(b). Determine the acceleration of 'C' and angular acceleration of link 3, when crank 2 rotates at 20 radians per second.
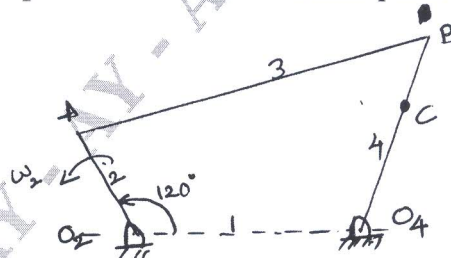

Fig Q3(b)   **(16 Marks)**

OR

4 a. Explain equilibrium of two, three forces member and 2-force member with a torque.
                                                                                   (06 Marks)

b. A slider crank mechanism shown in Fig Q4(b). The force applied to the piston 1kN when the crank is at 120° from inner dead centre. Determine the input torque T, on link OA.
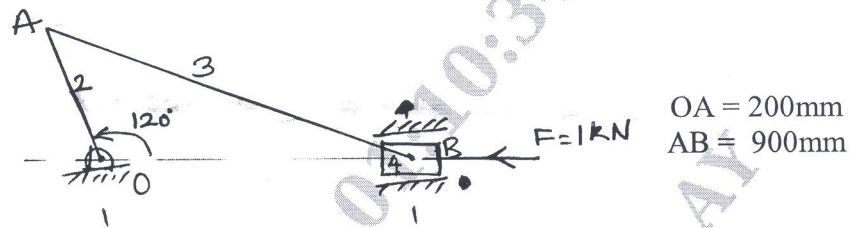

OA = 200mm
AB = 900mm

Fig Q4(b)

(14 Marks)

Module-3

5 a. State and derive Law of Gearing. (10 Marks)
   b. Explain different types of Gear train with neat sketches. (10 Marks)

OR

6 a. Explain with a sketch, epicyclic Gear train. (06 Marks)
   b. An epicyclic gear consists of 3-Gear A, B an C as shown in Fig Q6(b). The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of 'A' at 18rpm. If the gear 'A' is fixed. Determine the speed of gears B and C.
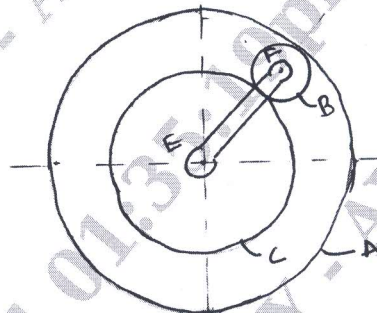

Fig Q6(b) (14 Marks)

Module-4

7 a. Explain static and Dynamic balancing. (06 Marks)
   b. A, B, C and D are 4-masses carried by a rotating shaft at medium 100mm, 125mm, 200mm and 150mm respectively. The planes in which the masses revolve are spaced 600mm apart and the masses B, C and D are 10Kg, 5Kg and 4Kg respectively. Find the required mass A and the relative angular positions of the masses to keep the shaft in balance. (14 Marks)

OR

8 The pistons of a 4-cylinder vertical inline engine reach their uppermost position at 90° in order of their axial position. Pitch of cylinder = 0.35m, Crank radius = 0.12m, length of connecting rod = 0.42m. The engine runs at 600rpm. If the reciprocating parts of each engine has mass of 2.5Kg. Find the unbalanced primary and secondary forces and couples. Take central of engine as reference. (20 Marks)