EX/PRN/T/213/2019

B.PRINTING ENGINEERING EXAMINATION, 2019

(2nd Year, 1st Semester)

MECHANISM

Time: 3 hrs. Full marks: 100

(Attempt any one from (a) and (b) in Question-1.)

1. (a) (i) What is **Machine** ? Giving examples, differentiate between a **machine** and a **structure.** (5)

(ii) Explain the terms: (I) Lower pair, (II) Higher pair , (III) Kinematic chain (5)

(b) (i) What is meant by "degree of freedom" of a mechanism? Explain **GRUBLER's** criterion for determining degree of freedom for mechanism. (4)

(ii) Find the **degree of freedom** as shown in **FIGURE-1** and **FIGURE-2** and total number of binary joints of kinematic chain as shown in **FIGURE-3** and **FIGURE-4**. (6)

(Attempt any one from (a) and (b) in Question-2)

2. (a) (i) Calculate the force acting in a mechanism of a four bar chain as shown in **FIGURE-5**, at the point B,and what is the difference between ideal mechanical advantages and actual mechanical advantage in this four bar chain. (10)

(ii) In a four bar mechanism **ABCD, AD** is fixed and is **150mm long.** The crank **AB** is **40mm** long and rotates at **120rpm CW**, while the link **CD=80mm** oscillates about **D, BC** and **AD** are equal in lengthg and ∟**BAD=60°**,

Draw : (I) **Space diagram**; (II) **Velocity diagram**; (III) The **angular velocity** of link **CD.**

(3+4+3=10)

(b) (i) What do you understand by the instantaneous centres of rotation in kinematic of machine? (4)

(ii) How the velocity of a point on a link is determined by instantaneous centre method? (6)

(iii) Locate all the **instantaneous centres** of the slider crank mechanism as shown in **FIGURE-6**, the length of the **crank OB** and connecting rod **AB** are **100mm** and **400mm** respectively. Find: (I) **velocity of the slider A**; (II) **angular velocity** of the connecting **rod AB**. (5+5=10)

(Attempt any one from (a) and (b) in Question-3.)

3.(a) (i) **Identify** the kinematic chains to which the following mechanisms belong:
(I) Beam Engine; (II) Ellipitical Trammels;
(III) Steam Engine Mechanism; (IV) Whitworth Quick-Return Mechanism. (2.5X4)

(ii) Sketch and explain any two inversions of a double slider crank chain. (10)

(b) (i) **Sketch** and **describe** the working for one of two different types of **quick return mechanism**. Give examples of **their application**. **Derive** an **expression** for the **ratio of times** taken in **forward** and **return stroke** for one of these mechanisms. (10)

(ii) The length of the fixed link of a crank and slotted-lever mechanism is **250mm** and that of the crank is **100mm**. **Draw** the **diagram** and **determine**: (I) inclination of the slotted lever with the vertical in the extreme position; (II) ratio of the time of cutting stroke to the time of return stroke; (III) length of the stroke, if the length of the slotted lever is **450mm** The line of stroke passes through the extreme position of the free end of the lever. (10)

(Attempt any two from (a),(b),(c) and (d) in Question-4.)

4.(a) (i) What are the different types of chain? Explain with neat sketches, the power transmission chains. (8)
(ii) Find the relation between pitch(p) and pitch circle diameter(D) of a chain. (4)
(iii) Obtain an expression for the length of a chain. (8)

(b) (i) Discuss briefly the various types of flat belts used for the transmission of power. (8)
(ii) Obtain an expression for the length of a belt in Cross belt drive. (8)
(iii) Determine the angle of contact/lap with neat sketch in open belt drive. (4)

(c) (i) What do you understand by " **Gear train**", **Discuss** the various types of gear trains with **neat sketches.** (10)

(ii) How the **velocity ratio** of **epicyclic gear** train is obtained by **tabular method/ algebraic method.** (5)

(iii) Explain with neat sketch the " **Sun and Plant wheel".** (5)

(d) A Cam is to be designed for a knife edge follower with the following data:

(i) Cam lift =**50mm** during **90°** of cam rotation with **S.H.M.;**

(ii) Dwell for next **30°**;

(iii) During the next **60°** of cam rotation, the follower returns to its original position with **S.H.M.;**

(iv) Dwell during the remaining **180°.**

The radius of the base circle=**40mm** and cam rotates at **240rpm.** The line of stroke of the follower passes through the axis of the cam shaft.

Draw the cam profile, determine the maximum velocity and **acceleration** of the **follower** during its ascent and descent. (12+4+4=20)

(Attempt any one from (a) and (b) in Question-5.)

5. (a) The gearing of a machine tool of printing offset machine is shown in **FIGURE-7**, consists of of compound gears **B-C** and **D-E.** All gears are mounted on parallel shafts. The motor shaft rotating at **800rpm** is connected to the **gear A and B** the output shaft to the **gear F.** The numbers of **teeth** on gears **A,B,C,D,E and F** are **24,56,30, 80,32 and 72** respectively. **Determine** the speed of the **Gear F.** (10)

(b) In a printing offset machine a solid cylinder is to transmit **300kW** power at **100rpm.** Find: (i) diameter of the cylinder; the shear stress of the cylinder material $\tau = 80N/mm^2$.

(ii) what per cent saving in weight would be obtain if this cylinder is replace by a hollow one whose internal diameter equals to 0.6 of the external diameter, the length , the material and shear stress being the same. (10)

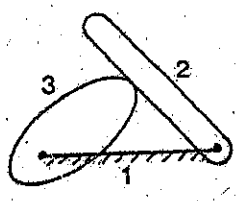

FIGURE- 1.

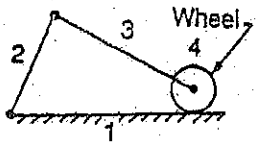

FIGURE- 2.

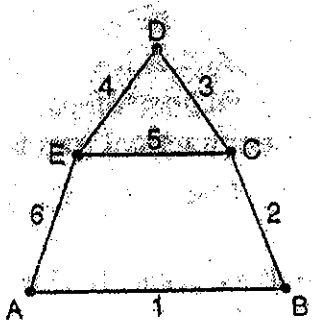

FIGURE- 3.

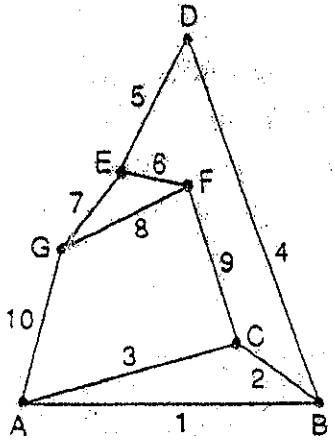

FIGURE- 4.

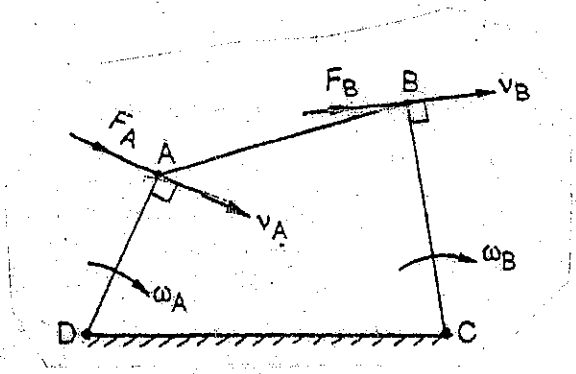

FIGURE- 5.

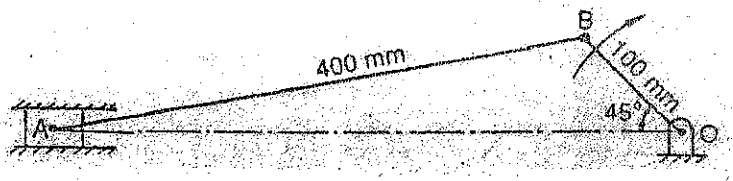

FIGURE- 6.

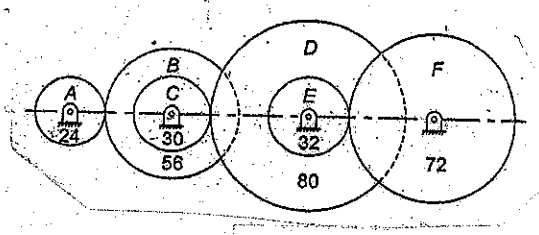

FIGURE- 7.