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## GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester - Regular) Examinations, December – 2022

### 21BAEES23005 – Theory of Machines

(AGE)

Time: 3 hrs

Maximum: 70 Marks

#### Answer ALL questions

(The figures in the right hand margin indicate marks)

#### PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

- |                                                                                                                               | CO # | Blooms Level |
|-------------------------------------------------------------------------------------------------------------------------------|------|--------------|
| a. What do you mean by inversion of a mechanism.                                                                              | CO1  | K1           |
| b. Write notes on complete and incomplete constraints in lower and higher pairs, illustrating your answer with neat sketches. | CO1  | K2           |
| c. State the ‘ Kennedy’s Theorem’ of three instantaneous centres.                                                             | CO2  | K1           |
| d. Differentiate spur gears and helical gear.                                                                                 | CO3  | K2           |
| e. Discuss the advantages and disadvantages of V-belt Drive Over Flat Belt Drive                                              | CO4  | K2           |

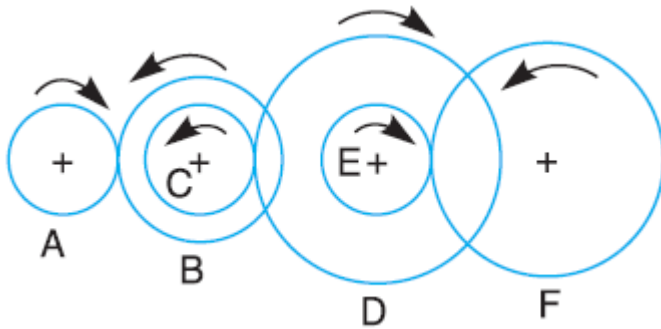
#### PART – B

(15 x 4 = 60 Marks)

Answer ALL the questions

- |                                                                                                                                                                                                                                                                                                                                         | Marks | CO # | Blooms Level |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|--------------|
| 2. a. Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain?                                                                                                                                                                                                                                     | 8     | CO1  | K3           |
| b. Explain the term kinematic link. Give the classification of kinematic link.                                                                                                                                                                                                                                                          | 7     | CO1  | K2           |
| (OR)                                                                                                                                                                                                                                                                                                                                    |       |      |              |
| c. Sketch and explain the various inversions of a single slider chain Mechanism.                                                                                                                                                                                                                                                        | 10    | CO1  | K3           |
| d. With neat diagram explain Oldham Coupling.                                                                                                                                                                                                                                                                                           | 5     | CO1  | K3           |
| 3.a. Locate all the instantaneous centres for a four bar mechanism. The lengths of various links are : Fixed link, AD = 125 mm ; Crank, AB = 62.5 mm ; BC = CD = 75 mm. If the link AB rotates at a uniform speed of 10 r.p.m. in the clockwise direction, find the angular velocity of the links BC and CD.                            | 10    | CO2  | K2           |
| b. What do you understand by the instantaneous centre? Discuss different types of instantaneous centres for a mechanism.                                                                                                                                                                                                                | 5     | CO2  | K2           |
| (OR)                                                                                                                                                                                                                                                                                                                                    |       |      |              |
| c. In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°. Solve it by relative velocity method.                              | 10    | CO2  | K3           |
| d. Draw the acceleration diagram of a slider crank mechanism.                                                                                                                                                                                                                                                                           | 5     | CO2  | K2           |
| 4.a. The gearing of a machine tool is shown in Fig. . The motor shaft is connected to gear A and rotates at 975 r.p.m. The gear wheels B, C, D and E are fixed to parallel shafts rotating together. The final gear F is fixed on the output shaft. What is the speed of gear F ? The number of teeth on each gear are as given below : | 8     | CO3  | K3           |

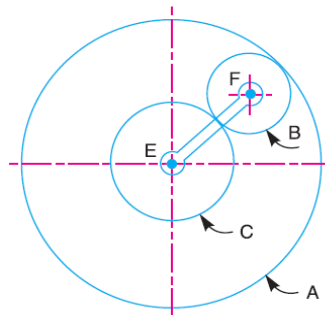
Gear	A	B	C	D	E	F
No. of teeth	20	50	25	75	26	65



- b. Derive the expression for velocity ratio of Compound gear train. 7 CO3 K4

(OR)

- c. An epicyclic gear consists of three gears A, B and C as shown in Fig. 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 18 r.p.m.. If the gear A is fixed, determine the speed of gears B and C. 8 CO3 K4



- d. Sketch and explain Rack and pinion Mechanism. 7 CO3 K3
- 5.a. A casting weighing 9 kN hangs freely from a rope which makes 2.5 turns round a drum of 300 mm diameter revolving at 20 r.p.m. The other end of the rope is pulled by a man. 10 CO4 K4

The coefficient of friction is 0.25. Determine 1. The force required by the man, and 2. The power to raise the casting.

- b. Discuss relative merits and demerits of belt, rope and chain drive for transmission of power. 5 CO4 K2

(OR)

- c. The power is transmitted from a pulley 1 m diameter running at 200 r.p.m. to a pulley 2.25 m diameter by means of a belt. Find the speed lost by the driven pulley as a result of creep, if the stress on the tight and slack side of the belt is 1.4 MPa and 0.5 MPa respectively. The Young's modulus for the material of the belt is 100 MPa. 8 CO4 K3

- d. Describe with a neat sketch a centrifugal clutch. 7 CO4 K3

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