Total No. of Printed Pages: 02

| PRN No. | |
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| PAPER CODE | U313-2113-ESE |
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**December 2023 (ENDSEM) EXAM**

**TY B.TECH (SEMESTER - I)**

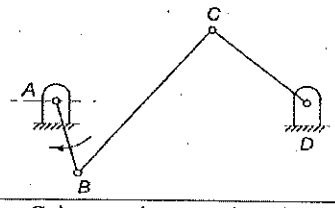
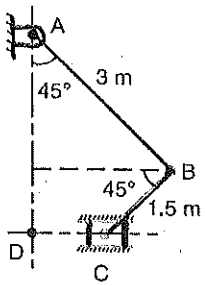
**COURSE NAME: KINEMATICS AND THEORY OF MACHINES** **Branch: Mechanical** **COURSE CODE: MEUA31203**

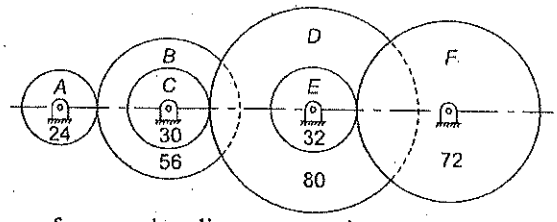
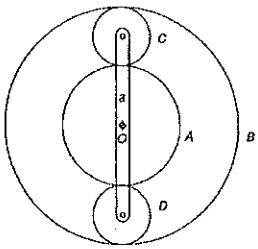
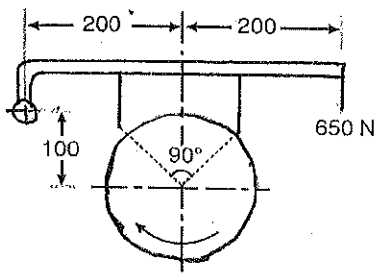
**(PATTERN 2020)**

**Time: [1Hr. 30 Min]** **[Max. Marks: 40]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any one sub question from Question 3 and any two sub questions each from Questions 4, 5 and 6 respectively.**

| Q. No. | Question Description | Max. Marks | CO mapped | BT Level |
|---|---|---|---|---|
| Q.1 | a) Differentiate between Machine and Structure. | [2] | 1 | 3 |
| Q2 | a) Estimate the 'Instantaneous Centre of Rotation' for a given mechanism.   | [2] | 2 | 4 |
| Q3. | a) In Fig., the slider C is moving to the right with a velocity of 1 m/s. Estimate the velocity of the links AB and BC using a graphical method.   | [6] | 3 | 4 |
| | b) The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in a clockwise direction at 120 rad/s. Estimate the velocity and acceleration of the piston with the help of Klein's construction when the crank is at 30° to I.D.C. | [6] | 3 | 4 |
| Q.4 | a) The number of teeth on each of the two equal spur gears in the mesh is 40. The teeth have a 20° involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum. | [5] | 4 | 4 |
| | b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gear is involute with $20^0$ pressure angle, 12 mm module and an addendum of 10 mm. Estimate the length of path of contact. | [5] | 4 | 4 |

| | | | | |
|---|---|---|---|---|
| | c) Two spur gears with 20° involute tooth profile have a module of 10 mm. The addendum is equal to one module. The larger gear has 40 teeth while the pinion has 20 teeth. Estimate path of contact. Will the gear interfere with the pinion? | [5] | 4 | 4 |
| Q.5 | a) The gear train is shown in Fig. The motor shaft is connected to gear A and rotates at 800 r.p.m. The number of teeth gears A B, C, D, E and F are 24, 56, 30, 80, 32, and 72 respectively. fixed to parallel shafts rotating together. Estimate the speed of gear F.<br>  <br> | [5] | 5 | 4 |
| | b) The arm of an epicyclic gear train rotates at 100 rpm in counter-clockwise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the center of wheel A. Use the tabular method to determine the speed and direction of rotation of wheel B. | [5] | 5 | 4 |
| | c) An epicyclic gear train is shown in Fig. The number of teeth on 'A' and 'B' are 80 and 200 respectively. Estimate the speed and sense of rotation of arm 'a' if gear 'A' rotates at 100 rpm clockwise and 'B' is stationary.<br>  <br> | [5] | 5 | 4 |
| Q.6) | a) Deduce an expression for the friction torque considering both uniform pressure and uniform wear theories for flat collar bearing. | [5] | 6 | 4 |
| | b) Conical pivot bearing supports a vertical shaft of 200 mm diameter. It is subjected to a load of 30 kN. The angle of the cone is 120° and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140 rpm., assuming 1. Uniform pressure; and 2. Uniform wear. | [5] | 6 | 4 |
| | c) A single block brake, as shown in Fig., has a drum diameter 250 mm. The angle of contact is 90° and the coefficient of friction between the drum and the lining is 0.35. If the operating force of 650 N is applied at the end of the lever, estimate the torque that may be transmitted by the block brake.<br>  <br> | [5] | 6 | 4 |