| U.S.N. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|

# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## October 2024 Supplementary Examinations

**Programme: B.E.**                                                    **Semester: III**
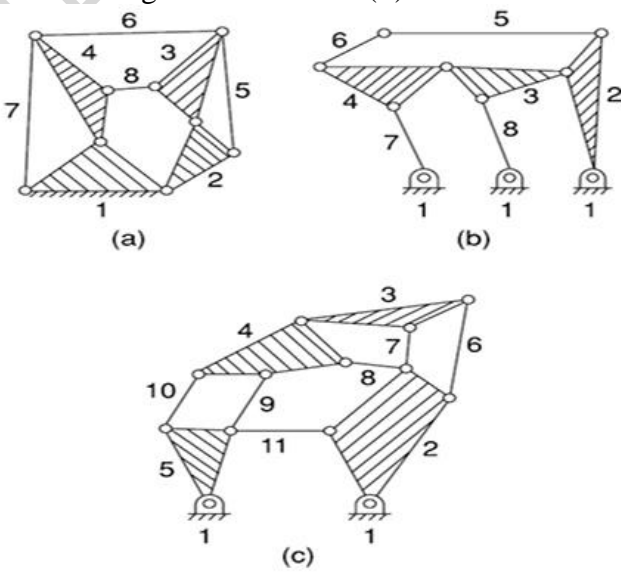**Branch: Aerospace Engineering**                          **Duration: 3 hrs.**
**Course Code: 23AS3PCTOM**                            **Max Marks: 100**
**Course:  Theory of Mechanisms**

**Instructions**:  1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

| | | | UNIT - I | CO | PO | Marks |
|---|---|---|---|---|---|---|
| 1 | a) | | Explain the types of constrained motion in detail. | CO1 | PO1 | **06** |
| | b) | | Define Kinematic pairs and discuss various types of kinematic pairs with examples. | CO1 | PO1 | **10** |
| | c) | | Explain the types of joints in kinematic motion in detail. | CO1 | PO1 | **4** |
| | | | **OR** | | | |
| 2 | a) | | Explain the Crank and slotted-lever Mechanism with a neat sketch | CO1 | PO1 | **08** |
| | b) | | For the kinematic linkages shown in following fig. no. 2b calculate the following: The numbers of binary links (Nb) The numbers of ternary links (Nt) The numbers of other (quaternary) links (No) The numbers of total links (n) The numbers of loops (L) The numbers of joints or pairs (P1) The numbers of degrees of freedom (F)  FIG. No. 2b | CO1 | PO2 | **12** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **UNIT - II** | | | |
| | 3 | a) | Draw a neat sketch and explain Peaucellier's exact straight line mechanism. | CO2 | *PO1* | **10** |
| | | b) | Explain Hart's straight line mechanism in detail. | CO2 | *PO1* | **10** |
| | | | **UNIT - III** | | | |
| | 4 | a) | Within a four-bar linkage PQRS, where PS is immobile and spans 150 mm, the crank AB, measuring 40 mm, rotates in a clockwise direction at a rate of 120 rpm. Simultaneously, the link RS, with an 80 mm length, undergoes oscillations around point S. Equally, QR and PS possess identical lengths. Determine the angular velocity of link RS at an angle QPS of 60 degrees, utilizing the relative velocity method. | CO3 | PO3 | **12** |
| | | b) | Consider a pin-connected four-bar linkage composed of four links characterized by the following dimensions: Fixed Link AD measures 4 meters in length, the Driving Link AB spans 1.5 meters, the Driven Link CD extends 2.5 meters, and the Connecting Link BC is 3 meters long. Furthermore, the angle <BAD is set at 60 degrees, and Link AB rotates at a rate of 25 revolutions per minute. Employing the Instantaneous Centre Method, determine: (i) the Angular Velocity of Link CD, and (ii) the Angular Velocity of Link BC.length. Find the angular velocity of link CD when angle BAD = 60°. | CO3 | PO3 | **08** |
| | | | **UNIT - IV** | | | |
| | 5 | a) | Explain with neat sketches and suitable equations about the length of the path of contact and length of the arc of contact. | CO4 | *PO1* | **08** |
| | | b) | Explain with neat sketches the classification of cam and followers also explain the classification of gears. | CO4 | *PO3* | **12** |
| | | | **OR** | | | |
| | 6 | a) | Two gears in mesh have a module of 8 mm and a pressure angle of 20°. The larger gear has 57 teeth while the pinion has 23 teeth. If the addenda on the pinion and gear wheel are equal to one module (1m), find <br> i) The number of pairs of teeth in contact and <br> ii) The angle of action of the pinion and the gear wheel. | CO4 | *PO3* | **08** |
| | | b) | Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form; module = 6 mm, addendum = one module, pressure angle = 20°. The pinion rotates at 90 r.p.m. Determine: i). The number of teeth on the pinion to avoid interference on it and the corresponding number of teeth on the wheel, ii). The length of path and arc of contact, iii).The number of pairs of teeth in contact, and  iv). The maximum velocity of sliding. | CO4 | *PO1* | **12** |
| | | | **UNIT - V** | | | |
| | 7 | a) | Explain with neat sketch about the simple and compound gear train. | CO4 | *PO1* | **10** |
| | | b) | Explain with neat sketch about the reverted  and epicyclic gear train. | CO4 | *PO3* | **10** |

******