CBCS SCHEME

17MA42

USN

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Theory of Machines

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume suitable value for missing data.

Module-1

1   a.   Distinguish between: (i) Machine and mechanism   (ii) Machine and structure   **(10 Marks)**
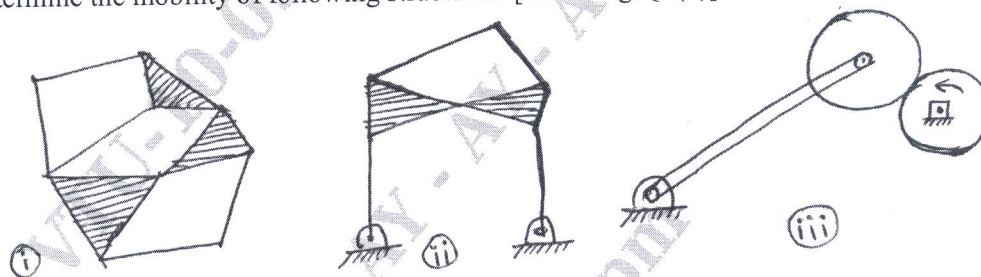   b.   Determine the mobility of following structures: [Refer Fig.Q1(b)]

Fig.Q1(b)   **(10 Marks)**

OR

2   a.   Sketch and explain Whitworth's Quick Return Motion Mechanism. Also, mention the applications.   **(10 Marks)**
    b.   With sketch, explain Geneva wheel mechanisms.   **(10 Marks)**

Module-2

3   A four bar mechanism ABCD is made up of four links, pin jointed at ends. AD is fixed link which is 180 mm long. The link AB, BC and CD are 90 mm, 120 mm and 120 mm long respectively. At certain instant, the link AB makes an angle of 60° with the link AD. If the link AB rotates at a uniform speed of 100 rpm clockwise, determine:
(i)   Angular velocity of the links BC and CD
(ii) Angular acceleration of the links CD and CB.   **(20 Marks)**

OR

4   A four bar chain ABCD has a fixed link AD = 1m. the driving crank AB = 0.3 m. The follower link CD = 0.6m and the connecting link BC = 1.2m. find the velocity and acceleration of point 'P' midway between B and C, when the angle BAD = 135° and AB rotates clockwise at a speed of 300 rpm with an angular acceleration of 20 rad/sec^2 in C.C.W. direction.   **(20 Marks)**

Module-3

5   a.   Derive expression for length of Arc of Contact.   **(10 Marks)**
    b.   Two gears in mesh have a module of 8 mm and pressure angle of 20°. The gear has 57 teeth while pinion has 23 teeth. If the addendum on pinion and gear are equal to one module. Find: (i) Number of pairs of teeth in contact   (ii) Angle of action of pinion and gear.   **(10 Marks)**

OR

6 a. What you mean by gear train? Explain in brief compound gear train and reverted gear train with reference to arrangement of gears. **(10 Marks)**

   b. What do you understand by term interference? Derive expression for minimum number of teeth required on gear and pinion to avoid interference. **(10 Marks)**

Module-4

7 a. What are types of friction? Mention the laws of static friction and dynamic friction. **(08 Marks)**

   b. Derive expression for frictional torque of flat pivot bearing, considering uniform pressure and uniform wear. **(12 Marks)**

OR

8 a. Derive expression for length of an open belt drive. **(10 Marks)**

   b. Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by cross belt. Find the length of belt required and the angle of contact between the belt and each pulley.

   What is power transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN and the coefficient of friction between the belt and pulley is 0.25? **(10 Marks)**

Module-5

9 A cam with 3 cm as minimum radius is rotating clockwise at a uniform speed of 1200 rpm and has to give the motion to the knife edge follower as defined below:

(i)   Follower to move outward through 3 cm during 120° of cam rotation with SHM.
(ii) Dwell for next 60°
(iii) Follower to return to its starting position during the next 90° with UARM.
(iv) Dwell for the remaining period.

Draw a cam profile, if follower axis is offset to right by 1 cm. Assume clockwise motion of cam. **(20 Marks)**

OR

10 Draw full size cam profile with roller of 25 mm diameter attached to the follower to give lift of 38 mm. Axis of the follower is offset to the right of the cam axis by 18 mm. Ascent of the follower takes place with SHM in 0.05 seconds, followed by period of rest 0.0125 second. The follower then descends with UARM during 0.125 seconds and remaining period rest at the minimum lifted position. The acceleration is being (3/5) times the retardation. The cam rotates in clockwise direction at constant speed 240 rpm and base circle radius is 50 mm. **(20 Marks)**

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