CBCS SCHEME

USN | | | | | | | | | | |

15MA42

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Theory of Machines

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Define : (i) Machine (ii) Mechanism. State an example for each. **(06 Marks)**

b. With neat sketch, define the following:
(i) Kinematic link (ii) Kinematic pair (iii) Kinematic chain.
(iv) Degree of freedom. (v) Inversion **(10 Marks)**

OR

2 a. With a neat sketch, explain Whitworth quick return mechanism. **(08 Marks)**

b. With a neat sketch, (i) Ratchet and Pawl mechanism. (ii) Geneva mechanism. **(08 Marks)**

Module-2

3 An I.C engine mechanism as shown in Fig. Q3 in which crank AB rotates at 600 rpm. The length of the crank AB is 0.5 m and connecting rod is 2 m long. When the crank is turned 45° from inner dead centre (I.D.C) find (i) Velocity of piston P. (ii) Angular velocity of connecting rod BP. (iii) Velocity of point D on the connecting rod which is at a distance of 0.5 m from B. (iv) Acceleration of point D and angular acceleration of connecting rod. **(16 Marks)**

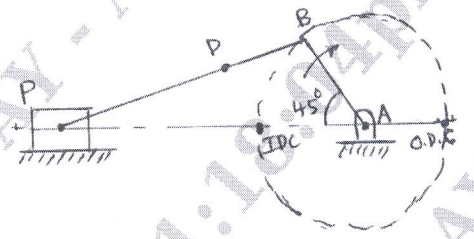

Fig. Q3

OR

4 Fig. Q4 shows a quick return mechanism in which the driving crank OA rotates at 120 rpm in a clockwise direction. For the position shown, determine the magnitude and direction of, (i) The acceleration of the block D (ii) The angular acceleration of the slotted bar QB. CD = 500 mm, QC = 150 mm and OA = 200 mm. **(16 Marks)**

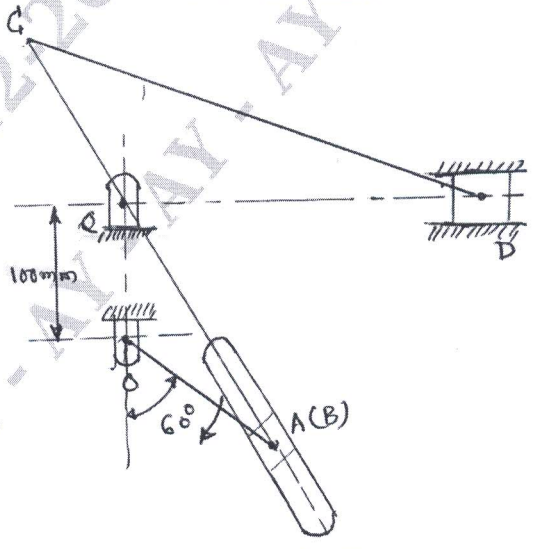

Fig. Q4

Module-3

5 a. State and explain with neat sketch the law of gearing. **(08 Marks)**

b. Two involute gears with numbers of teeth 28 and 45 are in mesh. If they have standard addendum (a = 1 m) and pressure angle is 20°, find the following : (i) Path of approach (ii) Path of recess (iii) Contact ratio (iv) Angle of approach for pinion if pinion is driver. Assume module = 3 mm. **(08 Marks)**

OR

6 a. Explain with neat sketch classification of gear trains. **(06 Marks)**

b. In an epicyclic gear of sun and planet type, the pitch circle diameter of the internally toothed ring (annulus) is to be 22.5 cm and the teeth are to have a diametrical pitch of 0.24. When the ring is stationary, the spider which carries three planet wheels of equal size, is to make one revolution for every five revolutions of the driving spindle. Determine the suitable number of teeth for all the wheels and the exact pitch circle diameter of the ring. **(10 Marks)**

Module-4

7 a. State the laws of,

(i) Static friction (ii) Dynamic friction **(08 Marks)**

b. In a flat belt drive, the initial tension is 2000 N. The coefficient of friction between the belt and the pulley is 0.3 and the angle of lap on the smaller pulley is 150°. The smaller pulley has a radius of 200 mm and rotates at 500 rpm. Find the power in kW transmitted by a belt. **(08 Marks)**

OR

8 a. For a flat belt, prove that $\frac{T_1}{T_2} = e^{\mu\theta}$. **(08 Marks)**

b. Two parallel shafts whose centre lines are 4.8 m apart are connected by open belt drive. The diameter of the larger pulley is 1.5 m and that of smaller pulley 1 m. The initial tension in the blet when stationary is 3 KN. The mass of the belt is 1.5 kg/m length. The coefficient of friction between the belt and the pulley is 0.3. Taking centrifugal tension into account, calculate power transmitted, when the smaller pulley rotates at 400 rpm. **(08 Marks)**

Module-5

9 a. Draw the displacement, velocity and acceleration diagrams for a follower when it moves with (i) Simple harmonic motion (ii) Uniform acceleration and retardation. **(08 Marks)**

b. A cam is to give the following motion to a knife edge follower: (i) Outstroke during 60° of cam rotation; (ii) Dwell for the next 30° of cam rotation; (iii) Return stroke during next 60° of cam rotation (iv) Dwell for the remaining 210° of cam rotation. The stroke of the follower is 40 mm and minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profits of the cam when the axis of the follower is offset by 20 mm from the axis of the cam shaft. **(08 Marks)**

OR

10 a. Explain with sketches the different types of cams and followers. **(06 Marks)**

b. Derive an expression for displacement, velocity and acceleration of follower when the roller is in contact with straight flank. **(10 Marks)**

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