

CBCS SCHEME

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15AU52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021 Dynamics of Machines

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- With usual notation, explain the principle of virtual work, considering a slider crank mechanism. (06 Marks)
 - For the static equilibrium of quick return mechanism shown in Fig.Q1(b). Find the required input torque T_2 for a force of 300N on slider D. Angle $\theta = 105^\circ$, take $\mu = 0.15$.

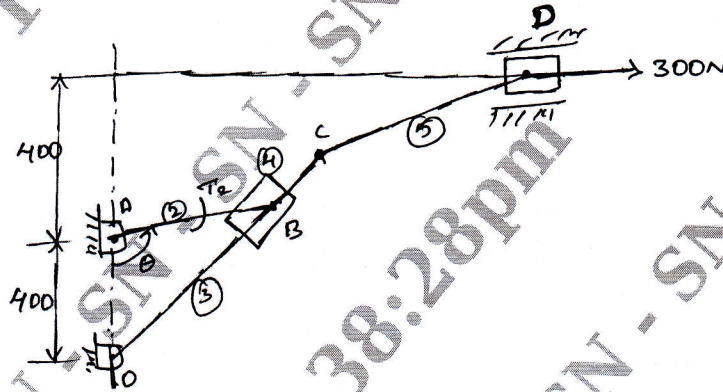


Fig.Q1(b)

(10 Marks)

OR

- State and explain 'D' Alembert's principle. (06 Marks)
 - Explain with neat diagram for inertia forces on engine mechanism (slider crank mechanism). (10 Marks)

Module-2

- Explain – balancing of several masses in different planes (graphical method). (04 Marks)
 - A shaft carries 4 rotating masses A, B, C and D along the axis, mass 'A' is concentrated at 160mm radius, 'B' at 180mm, 'C' at 200mm and 'D' at 120mm radii. Masses B, C and D are 40, 30 and 50kg respectively. Planes containing B and C are 300mm apart. Angular spacing of C and D are 90° and 210° with respect to 'B' in same direction. Determine :
 - Mass and angular position of 'A'
 - Position of planes A and D.(12 Marks)

OR

- A 5 cylinder inline engine running at 500 rpm has successive cranks at 144° apart. The distance between the cylinder centre line is 300mm. Piston stroke = 240mm length of CR = 480mm. Examine the engine for balance of primary and secondary forces and couples. Find the maximum value of these and position of central crank at which these maximum values occur. The reciprocating mass for each cylinder is 150N. (graphical method). (16 Marks)

Module-3

- 5 a. Define the following :
- Maximum fluctuation of speed
 - Co-efficient of fluctuation of speed
 - Total fluctuation of speed
 - Total fluctuation of energy. (08 Marks)
- b. A vertical double acting steam engine develops 73.6KW at 250rpm. e_{\max} is 30% of WD /stoke. The maximum and minimum speeds are not to vary more than 1% on either side of mean speed, find mass of flywheel required, if radius of gyration is 0.6m. (08 Marks)

OR

- 6 In a porter governor all the arms are 15cm long. Upper and lower are pivoted to the links 2cm and 3cm respectively from the axis. Central mass is 40kg. Force of friction is 30N and the extreme radii of rotation are 8cm and 10cm. Determine the range of speed of governor. (16 Marks)

Module-4

- 7 a. Derive an expression for frictional torque in a flat pivot bearing. Assume uniform pressure across the bearing surface. (06 Marks)
- b. A conical pivot supports a load of 20kN. The cone angle is 120° . The intensity of uniform pressure 300kN/m^2 and $\mu = 0.03$. The external radius is two times the internal radius. The speed of shaft is 120rpm. Determine the power lost in working against the friction. (10 Marks)

OR

- 8 a. A leather belt weighing 1.1gm/cm^2 has a maximum permissible stress of 2.1N/mm^2 . Determine maximum power for belt of 250mm wide and 10mm thick and $T_1 = 2T_2$. (06 Marks)
- b. Derive an expression for ratio of belt tensions for V-belt or Rope belt. (10 Marks)

Module-5

- 9 a. With usual notation and diagram, derive an expression for gyroscopic couple, produced by a rotating disc. (08 Marks)
- b. Analyse the stability of two wheel vehicle taking a turn and derive the necessary equation. (08 Marks)

OR

- 10 For a symmetrical tangent cam operating a roller follower, the least radius of cam is 30mm and roller radius is 15mm. The angle of ascent is 60° , total lift = 15mm. speed of cam shaft 300rpm. Determine :
- Principle dimensions of cam (i.e. distance between cam centre and nose centre, nose radius and angle of contact of cam with straight nose)
 - Acceleration of follower at the beginning of lift, where the roller just touches the nose and at the apex of circular nose. Assume that there is no dwell between ascent and descent.
 - Velocity of the follower at the beginning of lift and roller touches the nose. (16 Marks)
