

9. An open belt running over two pulleys 30cm and 60cm diameters connects two parallel shafts 3m apart and transmits 3.75kW from the smaller pulley that rotates at 300 r.p.m. co-efficient of friction between the belt and the pulleys is 0.3 and the safe working tension in 100N/cm width. Determine:

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- i) minimum width of the belt,
- ii) initial belt tension, and
- iii) length of the belt required.

OR

10. a) Find the condition for a differential band brake to be self-locking for clockwise rotation and anti-clockwise rotation of the brake drum.
- b) Explain the working principle of epicyclic train dynamometer.

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Roll No

ME - 505

B.E. V Semester

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Dynamics of Machines

Time : Three Hours

Maximum Marks : 70

Note: Attempt all questions. All questions carry equal marks. Assume missing/misprint data suitably if required.

1. a) Define and explain the term inertia force and inertia torque.
- b) The lengths of crank and connecting rod of a horizontal reciprocating engine are 210mm and 1.0m respectively. The crank is rotating at 420 r.p.m. When the crank has turned 30° from the inner dead center, the difference of pressure between the cover end and piston end is 0.4 N/mm^2 . If the mass of the reciprocating parts is 100Kg and cylinder bore is 0.4m, then calculate:
 - i) Inertia force,
 - ii) Force on piston,
 - iii) Piston effort,
 - iv) Thrust on the sides of cylinder walls,
 - v) Thrust in the connecting rod,
 - vi) Crank-effort and

Neglect the effect of piston rod diameter and frictional resistance.

OR

2. The torque exerted on the crank-shaft of a two-stroke engine is given by the equation:

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$$T(\text{Nm}) = 7000 + 1000 \sin 2\theta - 2000 \cos 2\theta$$

Where θ is the crank displacement from the inner dead centre.

Assuming the resisting torque to be constant, determine:

- the power developed when the engine speed is 300 r.p.m.
- the total fluctuations in speed in percentage and
- the maximum retardation of the flywheel.

The mass of flywheel is 500Kg and its radius of gyration is 750mm.

- Explain the term effort and power of governor.
- Calculate the minimum speed, maximum speed and range of the speed of a Porter governor, which has equal arms each 225mm long and pivoted on the axis of rotation. The mass of each ball is 5Kg and the central mass on the sleeve is 25Kg. The radius of rotation of the ball is 110mm when the governor begins to lift and 135mm when the governor is at maximum speed.

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OR

- Write a notes on Hartnell Governor.
- Explain the terms: Sensitiveness; Stability; Isochronisms and hunting in connection with governors.

5. A shaft carries four rotating masses A, B, C and D which are completely balanced. The masses B, C and D are 52Kg, 85Kg and 72Kg respectively. The masses C and D make angle of 90° and 195° respectively with mass B in the same sense. The masses A, B, C and D are concentrated at radius 75mm, 100mm, 50mm and 90mm respectively. The plane of rotation of masses B and C are 250mm apart. Determine:

- The mass A and its angular position,
- The position of planes of A and D.

OR

- Explain the procedure of balancing of V-engine.
- Explain the term partial balancing of primary forces. Why is it necessary?

- Differentiate between pivot and collar bearing.
- In a thrust bearing the external and internal radii of the contact surfaces are 220mm and 170mm respectively. The total axial load is 60kN and co-efficient of friction = 0.05. The shaft is rotating at 400 r.p.m. Intensity of pressure is not to exceed 350 kN/m^2 . Calculate:
 - Power lost in overcoming the friction and
 - Number of collars required for the thrust bearing.

OR

8. A multi-clutch has six plates (friction rings) on the driving shaft and six plates on the driving shaft. The external radius of the friction surface is 125mm where as the internal radius is 75mm. Assuming uniform wear and co-efficient of friction as 0.1, find the power transmitted at 2400 r.p.m. Axial intensity of pressure is not to exceed 0.20 N/mm^2 .