

(3 Hours)

Marks:80

Instructions:

- i) Question No.1 is compulsory.
- ii) Solve any three questions from the remaining five questions..
- iii) Assume suitable data wherever necessary.
- iv) Figure to the right indicates marks.

- Q.1 Solve any four questions from following
- a) Write the factors on which capacity of brakes depends. (05)
 - b) Explain how a governor differs from a flywheel? (05)
 - c) Derive an expression of gyroscopic couple on a naval ship during pitching. (05)
 - d) Explain the role of idler gear in simple gear train? (05)
 - e) Draw and explain the turning moment diagram for four stroke I.C. engine. (05)
- Q.2
- a) With a neat sketch explain the working of a centrifugal clutch. (06)
 - b) What are the various applications of flywheel? (04)
 - c) A cone clutch is used to transmit 80 KW power at 1440 rpm. The cone angle of clutch is 40° and coefficient of friction is 0.3. If the mean diameter of the bearing surface is 350 mm and allowable normal pressure is 0.2 N/mm^2 , determine the dimensions of conical bearing surface and the axial load. (10)
- Q.3
- a) Derive an expression for tensions in case of band and block brakes. (10)
 - b) A gyrowheel D of mass 0.5 Kg, with a radius of gyration of 20 mm, is mounted in a pivoted frame C as shown in fig.1. The axis AB of the pivot passes through the centre of rotation O of the wheel, but the centre of gravity G of the frame C is 10 mm below O. The frame has a mass of 0.3 Kg and the speed of the wheel is 3000 rpm in the anticlockwise direction as shown in fig.1 (10)

[TURN OVER]

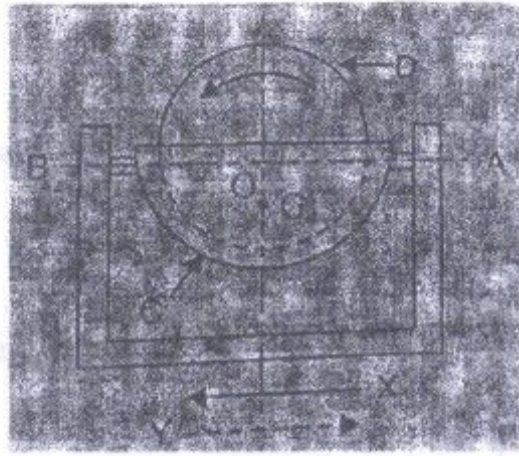


Fig.1

The entire unit is mounted on a vehicle so that the axis AB is parallel to the direction of motion of the vehicle. If the vehicle travels at 15 m/s in a curved of 50 m radius, find the inclination of the gyrowheel from the vertical, when

- i) The vehicle moves in the direction of the arrow 'X' taking a left hand turn along the curve.
- ii) The vehicle reverse at the same speed in the direction of arrow 'Y' along the same path.

Q.4 a) Explain Proell governor with neat sketch, also derive an expression for height of a Proell governor. (10)

b) An I.C. engine running at 2000 rpm has the following data: (10)

Crank radius = 60 mm, length of connecting rod = 240, diameter of piston = 100 mm, mass of the reciprocating parts = 1.5 Kg, pressure on the piston during power stroke = 0.9 N/mm^2 , displacement of piston from I.D.C. = 15 mm. Find

- i) Net load on the gudgeon pin
- ii) Thrust in the connecting rod
- iii) Piston side thrust
- iv) The engine speed at which the above value becomes zero

Q.5 a) What are the various types of gear boxes? Explain any one of them in details? (10)

b) An epicyclic gear train as shown in fig.2 has wheel S with 15 teeth fixed to a motor shaft running at 1450 rpm. The planet has 45 teeth and it gears with fixed annular wheel A and rotates on a spindle carried by an arm which is fixed to the output shaft. P also gears with S. Find the speed of the output shaft if the motor is transmitting 1.5 KW power. What is the torque exerted on the annular A. (10)



Fig.2

- Q.6 a) A Hartnell governor having a central sleeve spring and two right angle bell crank lever moves between 290 rpm and 310 r.p.m. for a sleeve lift of 16 mm. The sleeve arms and the ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from the governor axis and the mass of each ball is 2.7 Kg. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine the following:- (10)
- i) Loads on the spring at the lowest and the highest equilibrium speeds
 - ii) Stiffness of the spring.
- b) Explain the correction couple. (05)
- c) Differentiate between plate clutch and cone clutch. (05)
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