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Total Number of Pages : 02

B.Tech.
PCME4207

4th Semester Back Examination 2017-18
MACHINE DYNAMICS
BRANCH : MARINE, MINERAL, MINING
Time : 3 Hours
Max Marks : 70
Q.CODE : C1111

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 Answer the following questions : (2 x 10)

- a) Differentiate between machine and mechanism.
- b) Define Kinematic chain, pair and link.
- c) A planar mechanism has 12 links and 20 joints. Calculate the number of degree of freedom for this mechanism using Grubler's criterion.
- d) Write some uses of double slider crank mechanism.
- e) Differentiate between reverted and epicyclical gear train with suitable diagram.
- f) Explain friction axis and friction circle.
- g) Describe the working principle of cone clutches.
- h) What is the difference between self locking and self energized brake?
- i) Derive the condition for maximum power transmission by a belt drive.
- j) Ball point pen is an example of which kinematic pair.

Q2 a) What do you mean by inversion mechanism? Describe the possible inversions of a double slider crank mechanism with help of neat sketches. (7)

b) The layout of a quick return mechanism of the oscillating link type is shown in Fig. 1, for a special purpose machine. The driving crank BC is 30 mm long and time ratio of the working stroke to the return stroke is to be 1.7. If the length of the working stroke of R is 120 mm, determine the dimensions of AC and AP. (3)

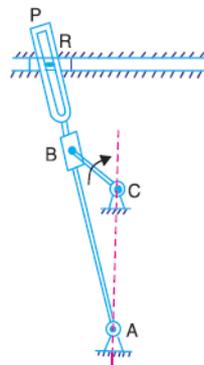


Fig. 1

Q3 Derive the expression for Coriolis's component of radial and tangential acceleration. (10)

- Q4** a) A single plate clutch, effective on both sides, is required to transmit 50 kW at 2000 r.p.m. Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.3, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm². Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. **(5)**
- b) A 50 mm diameter shaft running in a bearing carries a load of 1500 N. If the coefficient of friction between the shaft and bearing is 0.3, find the power transmitted when it runs at 1440 r.p.m. **(5)**

- Q5** The turning moment diagram of a multi-cylinder engine has been drawn to the scale of 1mm=325Nm vertically and 1mm=3° horizontally. The area above and below the mean torque line are -26, +378, -256, +306, -302, +244, -380, +261, -225 mm². The engine is running at a mean speed of 400rpm. The total fluctuation of energy is not to exceed 3.6% of the mean speed. If radius of flywheel is 0.7 m, Find the mass of the flywheel. **(10)**

- Q6** a) A compound gear train is shown in the Fig. 2; where all the gears are mounted on parallel shaft. The shaft is rotating at 600 rpm and connected to gear A and the output shaft is connected to gear F. The numbers of teeth on gear A, B, C, D, E and F is 20, 59, 30, 69, 23 and 74 respectively. Determine the speed of gear F. **(5)**

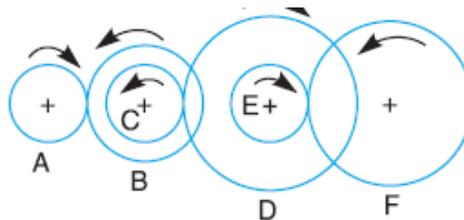


Fig. 2

- b) Explain the operation principle of an internal expanding shoe brakes with help of a neat sketch. **(5)**
- Q7** a) An open flat belt drive connects two parallel shafts 1.2 meter apart. The driving and the driven shafts rotate at 350 r.p.m. and 140 r.p.m. respectively and the driven pulley is 400 mm in diameter. The belt is 5mm thick and 80 mm wide. The coefficient of friction between the belt and pulley is 0.3 and the maximum permissible tension in the belting is 1.4 MN/m². Determine: 1. Diameter of the driving pulley, 2. maximum power that may be transmitted by the belting. **(8)**
- b) Describe the working principle of a single plate clutch. **(2)**
- Q8** **Write short notes on any TWO :** **(5 × 2)**
- Whitworth Quick-Return Mechanism.
 - Epicyclical gear train.
 - Grubler's equation for plane mechanism.
 - Kinematic Pair