

THEORY OF MACHINES
PAPER ID-ME 204, B.TECH 4th SEM.

TIME: 03 HRS

MAX MARKS: 60

SECTION -A

Q1)

- a) Explain pressure angle.
- b) What are the special advantages of epicyclic gear train?
- c) What is gyroscopic couple?
- d) What are the requirements of an equivalent dynamical system?
- e) Explain the term 'fluctuation of energy'.
- f) How does flywheel differ from that of governor?
- g) How the different masses rotating in different planes are balanced?
- h) Explain swaying couple.
- i) Explain length of path of contact.
- j) State the law of gearing.

SECTION-B

- Q2) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10mm addendum. Find the path of contact, arc of contact and contact ratio.
- Q3) Explain the effect of gyroscopic couple on a naval ship during steering and pitching?
- Q4) The vertical double acting steam engine has a cylinder 300mm diameter and 450mm stroke and runs at 200rpm. The reciprocating parts has a mass of 225 kg and the piston rod is 50mm diameter. The connecting rod is 1.2 m long. When the crank has turned through 125° from the top dead centre. The steam pressure above the piston is 30 KN/m². Calculate the effective turning moment on the crank shaft.
- Q5) Explain the 'direct and reverse crank' method for determining Unbalanced forces in radial engines?
- Q6) IF the crank and the connecting rod are 300mm and 1m long respectively and the crank rotates at a constant speed of 200 rpm. Determine:
- a) The crank angle at which the maximum velocity occurs.
 - b) Maximum velocity of the piston.

SECTION-C

- Q7) The three cranks of a three cylinder locomotive are all on same axle and are set at 120° . The pitch of the cylinders is 1 meter and the stroke of each piston is 0.6 m. The reciprocating masses are 300 kg for inside cylinders and 260 kg for each outside cylinder and the planes of rotation of the balance masses are 0.8 m from the inside crank. If 40% of the reciprocating parts are to be balanced, find;
- a) the magnitude and the position of the balancing masses required at a radius of 0.6 m.
 - b) the hammer blow per wheel when the axle makes 6 r.p.s.

- Q8) The speed ratio of reverted gear train as shown in figure -1 is to be 12. The module pitch of gear A and B is 3.125mm. and of gear C and D is 2.5mm. Calculate the suitable numbers of teeth for the gears. No gear is to have less than 24 teeth.
- Q9) A four wheeled trolley car of total 2000 kg running on rails of 1.6 m gauge rounds a curve of 30 m radius at 54 km/hr. the track is banked at 8° . The wheel have an external diameter of 0.7 m and each pair with axle has a mass of 200 kg. The radius of gyration for each pair is 0.3 m. The height of C.G. of the car above the wheel base is 1 m. Determine allowing for centrifugal force, gyroscopic couple action and the pressure on each rail.

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