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Roll No. _____

THIRD SEMESTER (Mechanica Engineering) B.Tech (Eve)

SUPPLEMENTARY EXAMINATION February 2019

CME-201 THEORY OF MECHINES

Time: 3.0 Hours

Max. Marks: 40

Note: Attempt any FIVE questions. All questions carry equal marks.
Assume missing data, if any.
Simple Graph may be permissible.

- 1 [a] Prove law of gearing. 2
- [b] Discuss the effect of isochronism of the governor. 2
- [c] Describe the effect of pitching and rolling of ship with the help of neat vector diagram. 2
- [d] Define tractive force and hammer blow in 2-cylinder, inside, 90° crank, inline and uncoupled locomotive engine. 2

2. A four bar chain mechanism has different links as shown in Fig.1 has AB=15 mm, BC=25 mm, CD=20 mm, AD=30 mm, BE=CE=16 mm, CG=10 mm and DG=14 mm. Draw the velocity and acceleration diagram when the crank makes 60° and rotates at 300 rpm in a clockwise direction. Determine the absolute velocity and acceleration of E and C. Also calculate the acceleration of G and E with respect to middle point of CD for the given instant. 8

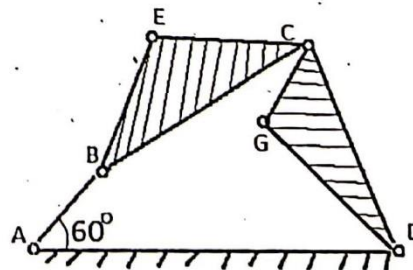


Fig.1

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3. Draw the displacement curve and cam profile for the concentric motion roller follower having radius 8 mm to attain the following specification of cam-follower mechanism.
The base circle of the cam has radius 20 mm and lift of follower is 20 mm.

The upward motion of follower is with uniform acceleration and retardation motion up to 120° .

The dwell period at the top most position is 60° .

The return motion of follower is with cycloidal motion till next 120° .

The rest is dwell period.

8

4. A epicyclic gear train shown in Fig.2 has a pinion A had 20 teeth and is rigidly fixed to the motor shaft. The wheel B had 40 teeth and gears with A, and also with annular fixed, wheel D. Pinion C had 18 teeth and is integral with B (C and B being a compound gear wheel). Gear C meshes with annular wheel E, which is keyed to the driven output machine shaft. The arm rotates about the same shaft on which A is fixed and carries the compound wheel B and C. If the motor runs at 100 r.p.m., using tabular method, find the speed of the machine shaft. Determine the torque exerted on the machine shaft if the motor develops a torque of 180 N-m.

8

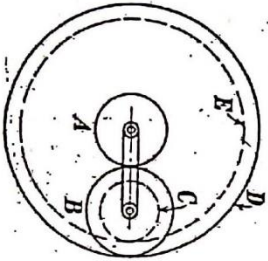


Fig.2

- 5.a) Draw and describe the turning moment diagram of single cylinder single acting steam engine.

4

- b) A mass of flywheel of a steam engine is 2000 kg and has got a radius of gyration of 76 cm. The starting torque of steam engine is 1300 N-m and may be assumed constant. Determine the angular acceleration of flywheel along with speed in rpm and kinetic energy after 12 seconds.

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6. The firing order of a six cylinder, two stroke, in line internal combustion engine is 1-4-2-6-3-5. The piston stroke is 12cm and the length of each connecting rod is 36 cm. The pitch distance between central line of piston are 10 cm, 19 cm, 15 cm, 20 cm and 10 cm successively. The reciprocating mass per cylinder is 0.75 kg and the engine runs at 4500 rpm. Determine the primary and secondary unbalance forces and couples on this engine, taking reference plane as midway between cylinder 3 and 4. (Use graphical method).

8

7. a) An aeroplane makes a complete half circle of 600m radius towards left when flying at 800 km/hour. The rotary engine and the propeller of the planes weigh 500 kg having a radius of gyration of 40 cm. The engine rotates at 9000 rpm clockwise viewing from the rear. Determine the gyroscopic couple on the aircraft and state its effect on it.
- b) With the help of neat sketch, describe the functioning of Wilson Hartnell mechanical governor.

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8. a) Describe the effect of whirling of the shaft and transmissibility ratio.

4

- b) A vertical U-tube has open end upward direction. It contains a liquid having density ρ half filled. Determine the natural frequency of the system.

4

END