

MANIPAL (A constituent unit of MAHE, Manipal)

IV SEMESTER B. TECH (IP ENGG.) END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: THEORY OF MACHINES [MME 2213]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

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Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitable assumed.
- 1A. Sketch and explain the followingi. Gnome Engine ii. Oscillating cylinder engine
- 1B. In a compound epicyclic gear train as shown in the figure 1B, has gears A and an annular gears D & E free to rotate on the axis P. B and C is a compound gear rotate about axis Q. Gear A rotates at 90 rpm in counterclockwise direction and gear D rotates at 450 rpm in clockwise direction. Using tabular method, find the speed and direction of rotation of arm F and gear E. Gears A, B and C are having 18, 45 and 21 teeth respectively. All gears having same module and pitch.
- 2A. In a mechanism shown in figure 2A, the crank AB rotates at 200 rpm in clockwise direction. The dimensions of the various links are AB = 12 cm, BC = 48 cm, CD = 18 cm, DE = 36 cm and EF = 12 cm and FP = 36 cm. Using relative velocity method determine the velocities of D, E, F and P
- 2B. The dimensions of a mechanism shown in Figure 2B are, OA = 200 mm, AB = 1.5 m, BC = 600 mm, CD = 500 mm and BE = 400 mm. Using instantaneous centre method find the angular velocities of B and C If crank OA rotates uniformly at 120 r.p.m in clockwise direction.

3A.

Draw the cam profile for following conditions:

Follower type = roller follower with offset by 5 mm to the right of cam centre; lift = 25 mm; base circle radius = 20 mm; roller radius = 5 mm; out stroke with UARM, for 120° cam rotation; dwell for 60° cam rotation; return stroke with UARM, for 90° cam rotation; dwell for the remaining period. Cam rotates at 1200 rpm in anticlockwise direction.

3B. State & prove law of gearing

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4A. A shaft carries four masses A, B, C and D placed in parallel planes perpendicular to the shaft axis and is in the same order as mentioned above along the shaft. Angle between B and C is 100⁰, B and A is 190⁰, and both the angles being measured in the anticlockwise (mass B is horizontal). Plane A and B are 250 mm apart, B and C are 500 mm apart. By graphical method, find (i) Masses in planes A and D (ii) Distance between planes C and D (iii) Angular position of mass D

	A	В	С	D
Mass (kg)		40	28	
Radius (mm)	200	160	160	200

- **4B.** A leather belt is required to transmit 8 kW from a pulley 1.5 m diameter running at 240 rpm. The angle of contact is 160⁰ and coefficient of friction between belt and pulley is 0.25. The safe working stress for leather is 1.5 MPa and density is 1000 kg/m³. Determine the width of the belt if its thickness is 10 mm. Take into account the effect of centrifugal tension.
- **5A.** Sketch and explain the working of elliptical trammel. Prove that it traces an ellipse.
- **5B.** Distinguish between longitudinal, transverse and torsional vibrations.
- **5C.** Explain the following terms and indicate them in a neat sketch, with reference to spur gear

i. Total depth ii. Pressure angle







Figure 2A



Figure 2B

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