



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



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IV SEMESTER B.TECH (INDUSTRIAL & PRODUCTION ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE - JULY 2016

SUBJECT: THEORY OF MACHINES [MME 2213]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitable assumed.
- 1A. Draw the neat sketch of crank and slotted lever quick return mechanism and determine the following if length of the fixed link is 250 mm and that of the crank is 100 mm
 - (i) Angle between extreme positions of slotted lever.
 - (ii) Ratio of the time of cutting stroke to that of return stroke.
- **1B.** What is interference in gears? Mention the methods to avoid it
- **2A.** An epicyclic gear train is shown in figure (a). The number of teeth on A and B are 80 and 200. Number of teeth on gear C and D are equal. By tabular method, determine the speed of the arm (a)
 - (i) If gear A rotates at 100 rpm clockwise and gear B at 50 rpm counterclockwise
 - (ii) If gear A rotates at 100 rpm clockwise and gear B is stationary.
- **2B.** A pair of gears 40 and 30 teeth respectively has 25⁰ involute form. Addendum is 5 mm and module is 2.5 mm. If the smaller wheel is the driver and rotates at 1500 rpm, find
 - (i) Length of path of contact
 - (ii) velocity of sliding at the point of engagement and at the point of disengagement
- **3A.** A shaft carries four masses A, B, C and D of magnitude 200 kg,300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B is 45⁰, B to C is 70⁰ and C to D is 120⁰. The balancing masses are to be placed in plane X and Y. The distance between planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitude and angular position by graphical method.

- **3B.** Derive the relation for ratio of belt tension in a flat belt drive
- **4A.** A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below:
 - i. To raise the valve through 50 mm during 120° rotation of the cam
 - ii. To keep the valve fully raised through next 30°
 - iii. To lower the valve during next 60° and
 - iv. To keep the valve closed during rest of the revolution

The diameter of the roller is 20 mm

Draw the profile of the cam when the line of the stroke is offset by 15 mm from the axis of the cam shaft. The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion.



5B. Locate all the instantaneous centres for the following mechanisms shown in figure (b) and figure (c) **5**



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