

Roll No.

Total No. of Pages : 02

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**B.Tech.(ME) (Sem.-3)
THEORY OF MACHINES – I**

Subject Code : BTME-302-18

M.Code : 76418

Date of Examination : 13-06-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly :

- a) Explain different types of kinematic links giving example for each one of them.
- b) What is meant by inversion of the mechanism?
- c) Differentiate between 'Turning Pair' and 'Rolling Pair'.
- d) Name the two different types of steering gear mechanisms. What are their merits and demerits?
- e) What is centrifugal tension in a belt? How does it affect the power transmitted?
- f) Explain with sketches the different types of followers used with cams.
- g) What is the function of a governor? How does it differ from that of a flywheel?
- h) Explain the terms 'Stability of Governor' and 'Sensitivity of Governor'.
- i) What are different types of chains?
- j) What is the function of a dynamometer? Give the classification of dynamometers.

SECTION-B

2. Sketch and explain any two inversions of 'Double Slider Crank Chain'.
3. Give a neat sketch of the straight-line motion 'Hart mechanism'. Prove that it produces an exact straight-line motion.
4. Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500 N.
5. Describe the construction and operation of a 'Epicyclic-train' dynamometer.
6. The turning moment diagram for a petrol engine is drawn to the following scales : Turning moment, 1 mm = 5 N-m; Crank angle, 1 mm = 1° . The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm². The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

SECTION-C

7. A flat ended valve tappet is operated by a symmetrical cam with circular arc for flank and nose. The straight line path of the tappet passes through the cam axis. Total angle of action = 150° . Lift = 6 mm. Base circle diameter = 30 mm. Period of acceleration is half the period of retardation during the lift. The cam rotates at 1250 r.p.m. Find: a) flank and nose radii; b) maximum acceleration and retardation during the lift.
8. a) A multi-disc clutch has three discs on the driving shaft and two on the driven shaft. The outside diameter of the contact surfaces is 240 mm and inside diameter 120 mm. Assuming uniform wear and coefficient of friction as 0.3, find the maximum axial intensity of pressure between the discs for transmitting 25 kW at 1575 r.p.m.
b) A car moving on a level road at a speed 50 km/h has a wheel base 2.8 metres, distance of C.G. from ground level 600 mm, and the distance of C.G. from rear wheels 1.2 metres. Find the distance travelled by the car before coming to rest when brakes are applied, i) to the rear wheels, ii) to the front wheels, and iii) to all the four wheels. The coefficient of friction between the tyres and the road may be taken as 0.6.
9. A Proell governor has all four arms of length 305 mm. The upper arms are pivoted on the axis of rotation and the lower arms are attached to a sleeve at a distance of 38 mm from the axis. The mass of each ball is 4.8 kg and are attached to the extension of the lower arms which are 102 mm long. The mass on the sleeve is 45 kg. The minimum and maximum radii of governor are 165 mm and 216mm. Assuming that the extensions of the lower arms are parallel to the governor axis at the minimum radius, find the corresponding equilibrium speeds.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.