Roll No. | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (ME) (Sem–3)

THEORY OF MACHINES-I

Subject Code : BTME-302-18

M.Code : 76418

Date of Examination : 01-06-2023

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) Define mechanism.

b) What is sliding pair? Give examples

c) Write any two inversions of double slider crank chain.

d) What is engine indicator?

e) Define velocity ratio of belt drive.

f) What is slip of belt?

g) What is roller follower?

h) Discuss single plate clutch.

i) What is the function of flywheel?

j) Define sensitivity of governor.

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SECTION-B

2. PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ = 62.5 mm; QR = 175 mm; RS = 112.5 mm; and PS = 200 mm. The crank PQ. rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS = 60° and Q and R lie on the same side of PS. Find the angular velocity and angular acceleration of links QR and RS.

3. What do you mean by straight line mechanism? Discuss Ackerman steering mechanism.

4. An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 metres apart and transmits 4 kW from the smaller pulley that rotates at 300 r.p.m. Coefficient of friction between the belt and the pulley is 0.3 and the safe working tension is 10N per mm width. Determine: 1. minimum width of the belt, i. initial belt tension, and 3. length of the belt required.

5. A vertical shaft supports a load of 20 kN in a conical pivot bearing. The external radius of the cone is 3 times the internal radius and the cone angle is 120°. Assuming uniform intensity of pressure as 0.35 MN/m^2, determine the dimensions of the bearing. If the coefficient of friction between the shaft and bearing is 0.05 and the shaft rotates at 120 r.p.m., find the power absorbed in friction. https://www.ptustudy.com

6. The turning moment diagram for a multicylinder engine has been drawn to a scale 1 mm = 600 N-m vertically and 1 mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as : + 52, -124, + 92, – 140, + 85, – 72 and + 107 mm^2, when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed ± 1.5% of the mean, find the necessary mass of the flywheel of radius 0.5 m.

SECTION-C

7. 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 :

   a) To raise the valve through 50 mm during 120° rotation of the cam;

   b) To keep the valve fully raised through next 30°;

   c) To lower the valve during next 60°; and

   d) To keep the valve closed during rest of the revolution i.e. 150°;

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The diameter of the roller is. 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft. The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m.

8. The arms of a Porter governor are 300 mm long. The upper arms are pivoted on the axis of rotation. The lower arms are attached to a sleeve at a distance of 40 mm from the axis of rotation. The mass of the load on the sleeve is 70 kg and the mass of each ball is 10 kg. Determine the equilibrium speed when the radius of rotation of the balls is 200 mm. If the friction is equivalent to a load of 20 N at the sleeve, what will be the range of speed for this position?

9. **Write short note on :**

a) Transmission dynamometer (any one type)

b) Beam engine

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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.

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