DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD – 402 103
Summer Semester Examination – May – 2019

Branch: B.Tech. (Mechanical) **Semester: IV**
Subject with Subject Code: Theory of Machines-I (BTMEC402) **Marks: 60**
Date: 16/05/2019 **Time:3 Hrs.**

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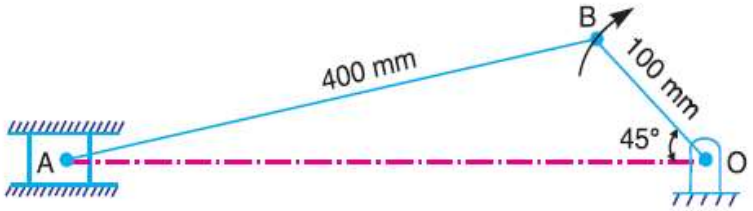
Instructions to the Students
1. Each question carries 12 marks.
2. Attempt any five questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.
5. Non programmable calculator is allowed.
6. Graphical numerical should solve on only drawing sheet.

(Marks)

Q.1.

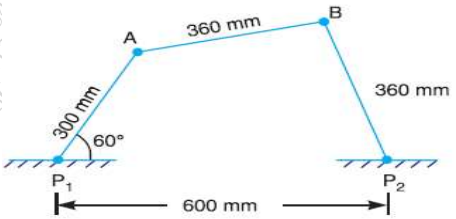
A. Explain in detail with diagram. Types of constrained motions. **(05)**

B. Locate all the instantaneous centres of the slider crank mechanism as shown in Fig.. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB (Graphical Method). **(07)**



Q.2.

A. The dimensions and configuration of the four bar mechanism, shown in Fig., are as follows : P1A = 300 mm; P2B = 360 mm; AB = 360mm, and P1P2 = 600 mm. The angle AP1P2 = 60°. The crank P1A has an angular velocity of 10 rad/s and an angular acceleration of 30 rad/s2, both clockwise. Determine the angular velocities and angular accelerations of P2B, and AB and the velocity and acceleration of the joint B. (Graphical Method)



(07)

B. The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Find with the help of Klein's construction: 1. Velocity and acceleration of the piston, 2. Velocity and acceleration of the mid point of the connecting rod, and 3. Angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30° to I.D.C. (inner dead centre). **(05)**

Q.3.

A. conical pivot supports a load of 20 kN, the cone angle is 120º and the intensity of normal pressure is not to exceed 0.3 N/mm2. The external diameter is twice the internal diameter. Find the outer and inner radii of the bearing surface. If the shaft rotates at 200 r.p.m. and the coefficient of friction is 0.1, find the power absorbed in friction. Assume uniform pressure. **(07)**

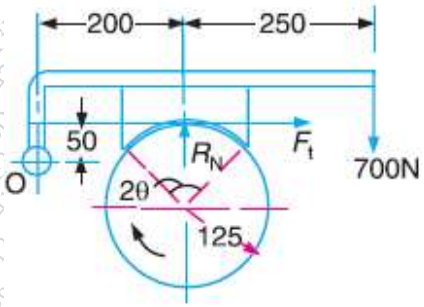
B. State the laws of

(i) Static friction ; (ii) Dynamic friction **(05)**

Q.4.

A. Determine the maximum, minimum and average pressure in plate clutch when the axial force is 4 kN. The inside radius of the contact surface is 50 mm and the outside radius is 100 mm. Assume uniform wear. **(06)**

B. A single block brake is shown in Fig. The diameter of the drum is 250 mm and the angle of contact is90°. If the operating force of 700 N is applied at the end of a lever and the coefficient of friction between the drum and the lining is 0.35, determine the torque that may be transmitted by the block brake. **(06)**



Q.5.

A. Explain with sketches the different types of followers. **(08)**

B. Define the following terms **(04)**

- **i.** Trace point
- **ii.** Pressure angle
- **iii.** Pitch curve
- **iv.** Prime circle

Q.6.

A. Explain balancing of several masses rotating in same plane by analytical method. **(06)**

B. Four masses m1, m2, m3 and m4 are 200 kg, 300 kg, 240 kg and 260 kg respectively The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m (Analytically). **(06)**