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Total no of pages : 4
Total No. of Questions:09

B. Tech (IIIrd Semester)

THEORY OF MACHINES-I
Subject Code : BTME-302
Paper ID : [A1139]

Time: 3 Hrs. **Max. Marks :60**

Note:- (1) *The question paper shall have three sections A, B and C each of 20 marks. Attempt all questions of section-A, any four of section-B and any two of section-C.*

SECTION-A (Compulsory) **10x2=20**

Q.1 (a) Define the term machine.

(b) Explain Kennedy's theorem of instantaneous centres.

(c) Explain simple and compound mechanisms.

(d) What is the condition of correct steering?

(e) What is initial tension in belts?

(f) Which motion of follower is preferred for high speed engines and why?

(g) What is the difference between absorption and transmission dynamometer

(h) Explain turning moment and crank effort diagram.

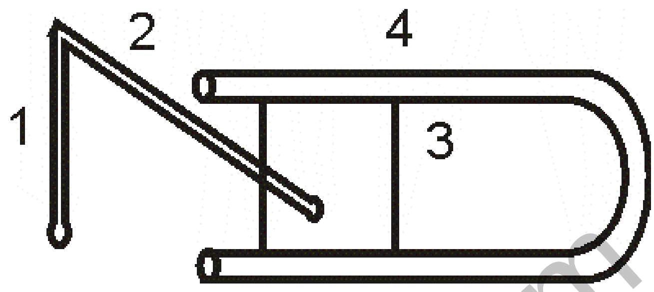
(i) Explain the terms sensitivity and stability of governors.

(j) Draw the diagrams of hartnell and Wilson-Hartnell governors to show difference between them.

SECTION-B

(4x5=20)

Q.2 In Fig-1 a slider crank chain is shown. Name the inversions (with figures) by fixing link 2 of the chain.



Link 1 = Crank

Link 2 = Connecting rod

Link 3 = Slider

Link 4 = Cylinder block

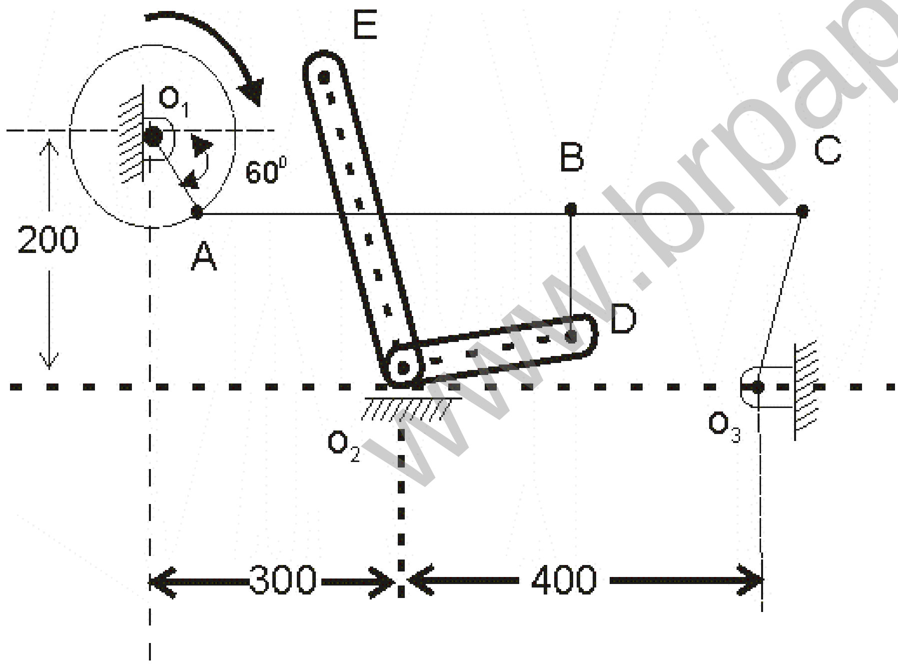
Fig : 1

Q.3 A Hooke's joint connects two shafts which are having 165° as the included angle. The driving shaft rotates uniformally at 100 r. p. m. Find the maximum angular acceleration of the driven shaft and the maximum torque required if the driven shaft carries a flywheel of mass 10 Kg and 100 mm radius of gyration.

Q4. The mechanism of a wrapping machine, as shown in Fig-2, has the following dimensions :

O_1A = 100mm, AC = 700 mm, BC = 200mm
O_3C = 200 mm, O_2E = 400 mm
O2D = 200 mm and BD = 150 mm

The crank O_1A rotates at a uniform speed of 100 rad/sec.
Find the velocity of point E of the bell crank lever by instantaneous centre method.



Dimensions in mm

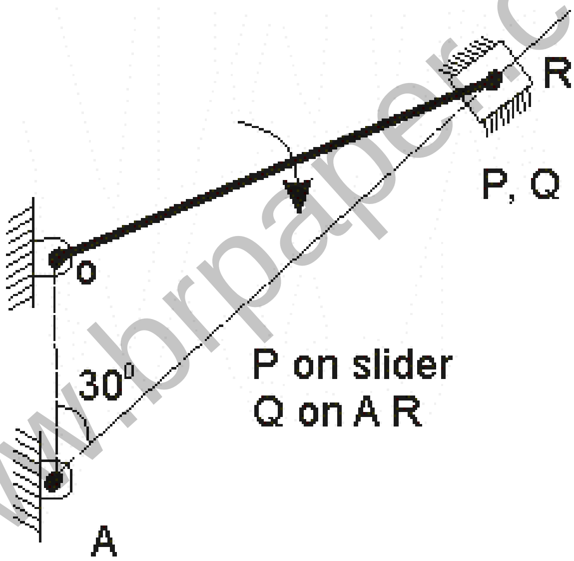
Fig : 2

Q.5 Determine the maximum power that can be transmitted through a flat belt having the following data :
Cross section of the belt = 300 mmx12 mm
Ratio of tensions = 2.4
Max. permissible tension in belt =2 M Pa
Mass density of belt material = 1.1×10^{-3} g/mm^3

Q.6 An automotive single plate chutch consists of a pair of contacting surfaces. The inner and outer radii of friction plate are 120mm and 250 mm respectively. The coefficient of friction is 0.25 and the total axial force is 15 KN. Calculate the power transmitting capacity of the clutch plate at 500 r. p. m. using (i) uniform wear theory, and (ii) uniform pressure theory.

SECTION-C **2x10=20**

Q.7



One cylinder of a rotary engine is shown in Fig-3.
OA is fixed crank,
200 mm long. OP is the connecting rod, 520 mm long. The line of stroke is along AR and at the instant is inclined at 30° to the vertical. The body of the engine consisting of cylinders rotate at a uniform speed of 400 r. p. m. about the fixed centre A. Determine the acceleration of the piston.

FIG-3

Q.8 A roller follower cam with a roller diameter of 10mm is rotating clockwise. The lift of the follower is 30 mm and the axis of the follower is offset to the right by a distance of 5 mm. The follower completes the lift with SHM during 120° of cam rotation.
The dwell at lift is 60° of cam rotation. First half of the fall takes place with constant velocity and second half with constant acceleration and retardation during 120° of cam rotation. The rest is the dwell at fall. Draw the profile of cam.

Q.9 (a) A flywheel of a steam engine weighs 2000N and got a radius of gyration of 760 mm. The starting torque of steam engine is 130 Kg-m and is taken as constant. Determine the angular acceleration of flywheel along with speed and kinetic energy after 10 seconds. **(4)**

(b) A governor is shown in Fig-4 schematically. **(6)**
The two links which carry the balls of mass m each are connected by a spring of stiffness K and has a natural length of 2e. Find the expression for the in elination of the links with the vertical when the governor rotates at a speed w.

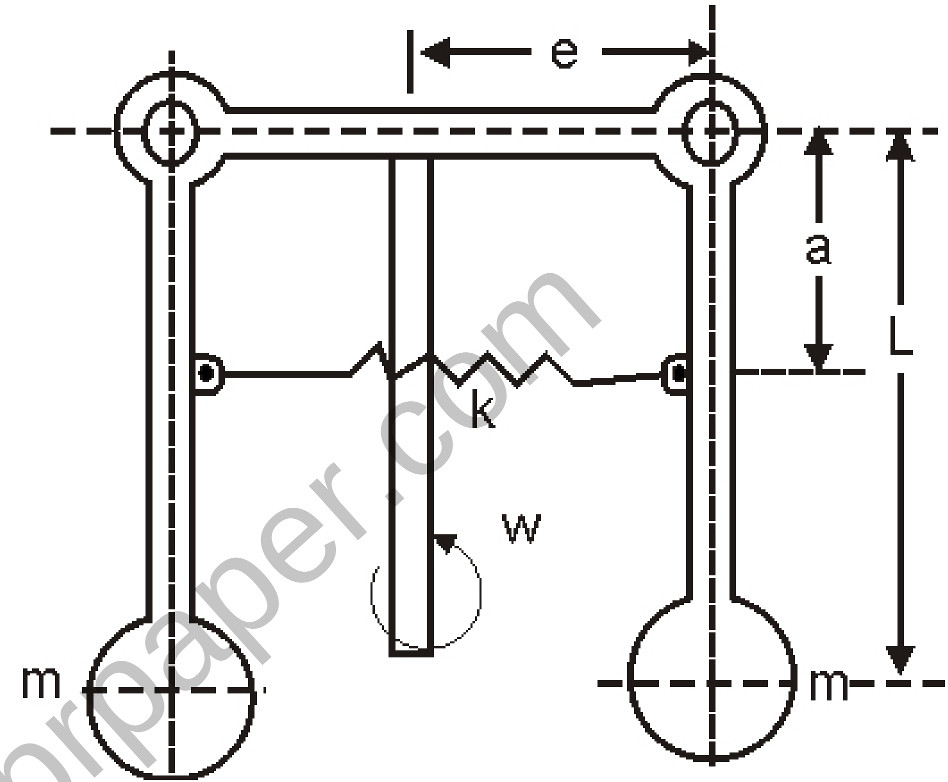


FIG-4

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