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SE-6861

B. E. III (Sem. - V) (Mech.) Examination

April/May – 2011

Theory of Machine - II

Time : **3** Hours] [Total Marks :**100**

Intructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 3 (Sem. - 5) (Mech.)**

Name of the Subject :

☛ **Theory of Machine - 2**

☛ Subject Code No. : **6 8 6 1** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Attempt all quetions.

(3) Figures to the right indicate full marks.

(4) Assume necessary data wherever required.

1 (a) Answer following questions :

(i) Explain static and dynamic force analysis. **4**

(ii) Draw TMD for 4-S I.C. engine. **2**

(iii) Show that for flywheel maximum fluctuations of energy is $\Delta E = E \times 2C_S$ **4**

(b) A punching press is required to punch 40mm diameter holes in a plate of 15 mm thickness at the rate of 30 holes per minute. It requires 6NM of energy per mm^2 of sheared area. If the punching take $\frac{1}{10}$ of second and rpm of flywheel varies from 160 to 140 determine the mass of the flywheel having radius of gyration = 1 meter. **10**

2 Attempt any **one** : **15**

(i) Figure - 1 shows four-bar mechanism for static equilibrium of mechanism determine the torque T_2.

AB = 20 cm, BC = 37 cm, CD = 25 cm, AD = 21.5 cm
CE = 10 cm.

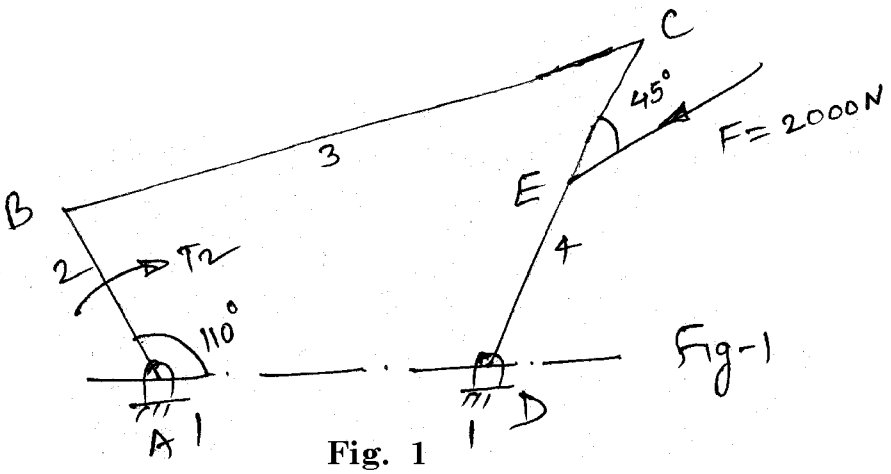

Fig. 1

(ii) Determine the torque required to maintain dynamic equilibrium of the four link mechanism ABCD. Neglect friction and inertia forces of link 2 and 3. Refer fig. 2
AB = 500 mm, BC = 660 mm, CD = 560 mm,

AD = 1000 mm,

W_2 = 10.5 r/s CCW, α_2 = 26 r/s^2 CW

I_4 = 61415 kg-mm^2

α_4 = 79.1 r/s^2 CCW

f_{G4} = 25.7 m/s^2 $\angle 222°$

m_4 = 4.2 kg/m

C_{G4} = 280 mm

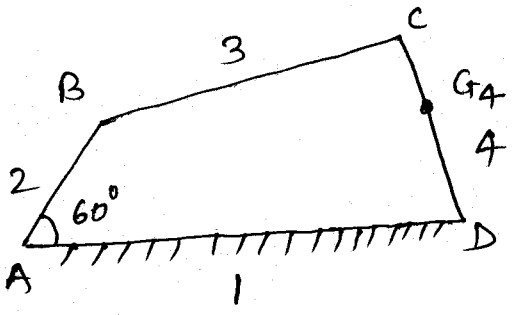

Fig. 2

3 Fig shows a planetory gear train **15**

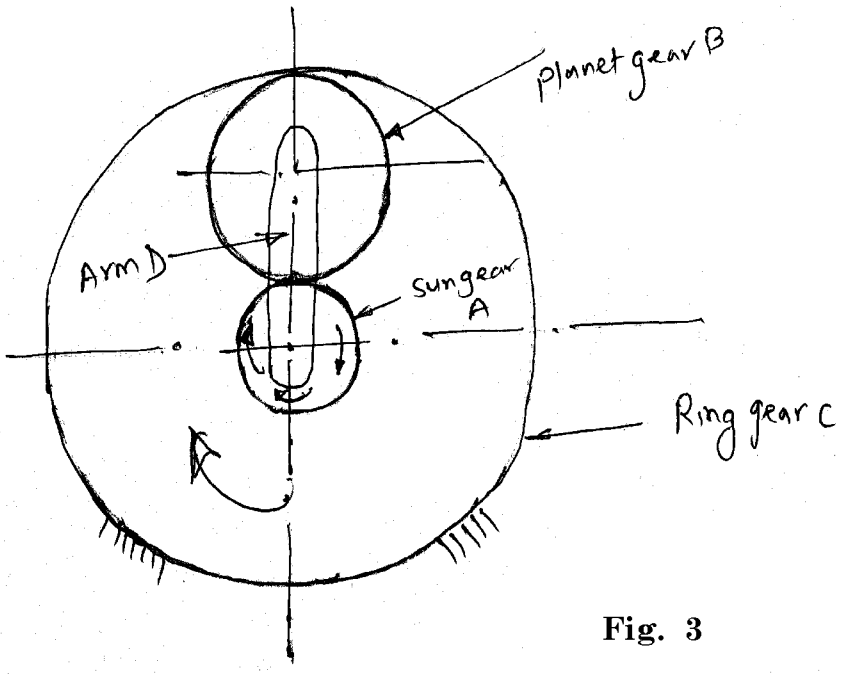

Fig. 3

Draw the FBD of forces acting on each gear and calculate torque at arm D

Power transmitted by sungear A = 5 kW

Speed of gear A = 1440 rpm CW, $\alpha = 20^{\circ}$

No. of teeth on gears are : Z_A = 30 teeth, Z_B = 60 teeth, Zc = 150 teeth, module = 6 mm.

4 (a) Attempt following questions :

(i) What do you understand by gyroscopic couple ? **2**

(ii) Explain the terms - Hunting and stability of governor. **4**

(iii) Explain tractire forces and hammer blow. **4**

(b) Explain in detail the effect of gyroscopic couple on naval ship during pitching. **10**

5 Attempt any **two** :

(i) A portor governor has equal arms of 250 mm long and pivoted on axis of rotation. Each ball has mass of 5 kg and mass of central load on the sleeve is 25 kg. The radius of gyration of ball is 150 mm when governor begins to lift and 200 mm when governor is at maximum speed. Find **16**

(a) Range of speed

(b) Sleeve lift

(c) Effort of governor when friction at sleeve is 10 N.

(ii) Derive the expression for the height of watt governor and prove that the height is inversely proportional to square of governor speed.

(iii) Explain the procedure of balancing of V-engine.

6 A four cylinder vertical engine has a crank 300 mm long. The planes of rotation of the I^{st}, III^{rd} and IV^{th} cranks are 750 mm, 1050 mm and 1650 mm respectively from that of the second crank and their receprocating masses are 150 kg, 400 kg and 250 kg repectively. Find the mass of the receprocating parts for the second cylinder and relative angular positions of the cranks in order that the engine may be in complete primary balance. **14**