MENOUFIA UNIVERSITY FACULTY OF ENGINEERING SHEBIN ELKOM SECOND SEMESTER EXAMINATION ACADEMIC YEAR:- 2014/2015



DEPARTMENT:PROD.ENG.&MECH.DESIGN YEAR:- FIRST (MCHANICAL POWER) SUBJECT/CODE:THEO.OF MACH./ PRE126 TIME ALLOWED: 3 HOURS DATE:- 31/5/2015

This exam measures the following ILOs(a4,a13,a19,b2,b17,c7)	
ANSWER THE FOLLOWING QUESTIONS :- (85 MARKS)	(MARKS)
Question No. 1 :-	(25)
A –In the mechanism shown in Fig.1, the crank O_2A rotates with uniform angular velocity of	
20 rad/s in clockwise direction. Determine for the given position the angular veloc	city and
angular acceleration of the link O_6C . Given :- O_2A = 4 cm, AB= 20 cm, O_2O_4 = 19 cm,	
$O_4B = 8 \text{ cm}, O_4O_6 = 4 \text{ cm} \text{ and } O_6C = 8 \text{ cm}$	(15)
B- If the driving torque that acting on the crank O $_2$ A is 40 N.m, find the resisting torque at	
link O_6C to maintain the mechanism in static equilibrium.	(10)
Question No. 2 :-	(20)
The variation of crank shaft torque of 4-cylinder petrol engine may be approximatel	У
represented by taking increase uniformly from zero to 280 N.m during the half revolution,	
then decrease uniformly to 140 N.m during the next half revolution. It then remain constant	
for the following one revolution. This cycle being repeated in every two revolutions. The	
average speed is 800 rpm. Supposing that the engine drives a machine requiring a c	constant
torque, determine:-	
A – The mass of the flywheel, of radius of gyration 0.4 m to limit the total speed va	riation
to 4 revolutions, and	,
B - The horse power necessary to drive the machine.	
B	



Question No. 3 :-

- A Two gear wheels of 6 module have 20 and 36 teeth respectively. The pressure angle is 20° and each wheel has a standard addendum of one module . Find the length of the path of contact and the maximum sliding velocity, if the angular velocity of the smaller wheel is 18 rad/s (8)
- B In the epicyclic gear train shown in Fig.(2), the wheel A and wheel E (40 teeth) are fixed to sleeve Y which is free to rotate on spindle X. The wheels B (24 teeth) and C (30 teeth) are keyed to a shaft which is free to rotate in a bearing on the arm F. The wheel D has 72 teeth. The driving wheel H has 20 teeth and is mounted on a shaft V rotating at 100 rpm in clockwise direction. If the annulus gear J is stationary and all the teeth are of the same pitch, find the speed and direction of the rotation of the shaft Z.

Question No. 4 :-

The following data is provided for a disk cam rotating clockwise at uniform speed:-

- The rise, upper dwell, and return angles are 90°, 30° and 120° degree respectively.
- The base circle radius is 30 mm.
- The motion during the rise and during the return are both simple harmonic.
 Draw the cam profile for translating roller-follower during 50 mm height, if the roller radius is 10 mm.

Also determine the maximum acceleration of the follower when the cam rotates at 100 rpm, and draw the displacement, velocity and acceleration diagrams for one complete revolution of the cam. J



Pr.Dr. S. Ghoeam

Fig. 2 GOOD LUCK With our best wishes

Dr.R. Aouelnasr



(25)

(15)