TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
BSc. Mechanical Engineering
EMG 2404 : MECHANICS OF MACHINES III
END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2016
TIME: 2 HOURS
DATE: Pick Date **Dec 2016**

Instruction to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt question **ONE** and any other **TWO** questions.

Maximum marks for each part of a question are as shown.

Do not write on the question paper.

Question ONE

The torque exerted on the crankshaft of an engine is given by the equation: $T(Nm) = 11900 + 2190\sin 2\Theta - 1430\cos 2\Theta$, where Θ is the crank angle displacement from the inner dead centre. Assuming the resisting torque to be constant, determine:

a) The power of the engine when the speed is 170 rev/min.
b) The moment of inertia of the flywheel if the speed variation is not to exceed ± 0.6% of the mean speed, and
c) The angular acceleration of the flywheel when the crank has turned through 35^o from the inner dead centre *(20 marks)*

Question TWO

In a symmetrical tangent cam operating a roller follower, the least radius of cam is 30 mm and roller radius is 17.5 mm. The angle of ascent is 75^o, lift is 17.5 mm and the speed of cam is 600 rpm.

Calculate,

i. Principal dimensions of cam
ii. The acceleration of the follower at the beginning of lift, where straight flank merges into the circular nose and at the apex of the circular nose. Assume that, there is no dwell between ascent and descent *(20 marks)*

Question THREE

A Hookes joint is to couple two shafts together. The driving shaft rotates at 800r.p.m. Working from first principles determine the greatest permissible angle between the shaft axes so that the speed of the driven shaft is between 775 and 825 r.p.m. What will then be the actual maximum and minimum speeds of the driven shaft? *(20 marks)*

Question FOUR

In a mechanism as shown in Fig. Q4, the link *AB* rotates with a uniform angular velocity of 30 rad/s. The lengths of various links are :
AB = 100 mm ; *BC* = 300 mm ; *BD* = 150 mm ; *DE* = 250 mm ; *EF* = 200 mm ; *DG* = 165 mm.
Determine the velocity and acceleration of *G* for the given configuration. (20marks)

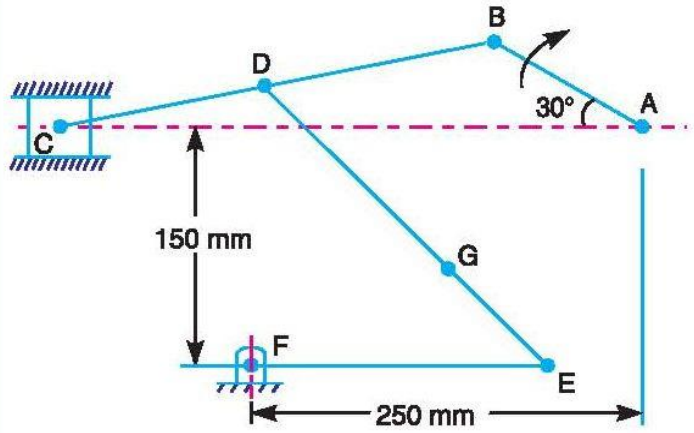

Fig. Q4

Question FIVE

Fig. Q5 shows a quick return motion mechanism in which the driving crank *OA* rotates at 120 r.p.m. in a clockwise direction. For the position shown, determine the magnitude and direction of:

a) the acceleration of the block *D*
b) the angular acceleration of the slotted bar *QB*.(20 marks)

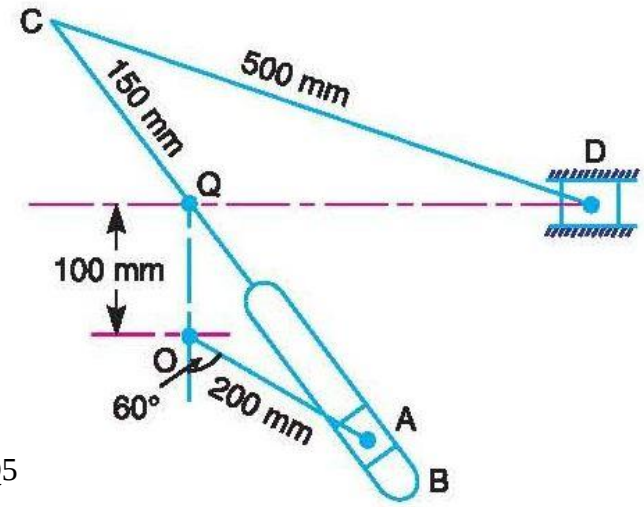

Fig.Q5