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 following particulars relate to a symmetrical circular cam operating a flat faced follower :

Least radius = 16 mm, nose radius = 3.2 mm, distance between cam shaft centre and nose centre = 25 mm, angle of action of cam = 150°, and cam shaft speed = 600 r.p.m.

Assuming that there is no dwell between ascent or descent, determine the lift of the valve, the flank radius and the acceleration and retardation of the follower at a point where circular nose merges into circular flank (20 marks).

Question TWO

In the mechanism shown in Fig. Q2, find the angular velocity and angular acceleration of the slotted member QDF when $\Theta=120^{o}$ and the member OA is rotating at 120 RPM clockwise. (20 marks)

Question THREE

In Fig. Q3, the link PR is rotating with angular velocity 2 rad/s clockwise and angular acceleration 2 rad/s^2 anticlockwise. Determine the angular velocity and angular acceleration of the link QS and also the linear acceleration of C, the mid-point of RS. (20 marks)

Question FOUR

The turning moment curve for an engine is represented by the equation,
$T = (20\,000 + 9500 \sin 2\theta - 5700 \cos 2\theta)$ N-m, where θ is the angle moved by the crank from inner dead centre. If the resisting torque is constant, find:

a) Power developed by the engine ;
b) Moment of inertia of flywheel, if the total fluctuation of speed is not to exceed 1% of mean speed which is 180 r.p.m; and
c) Angular acceleration of the flywheel when the crank has turned through 45° from inner dead centre.(20marks)

Question FIVE

A driving shaft having a uniform speed of 285 rev/min is coupled to a driven shaft by a Hooke's joint. If the speed of the driven shaft must always be between 300 and 270 rev/min, find the greatest permissible angle between the shafts. What will then be the actual maximum and minimum speeds of the driven shaft? Any formula used must be proved. (20marks)

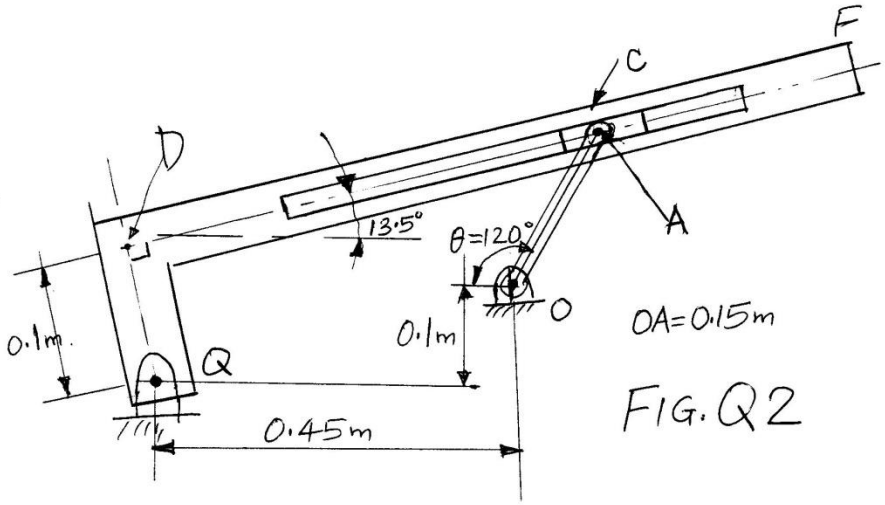
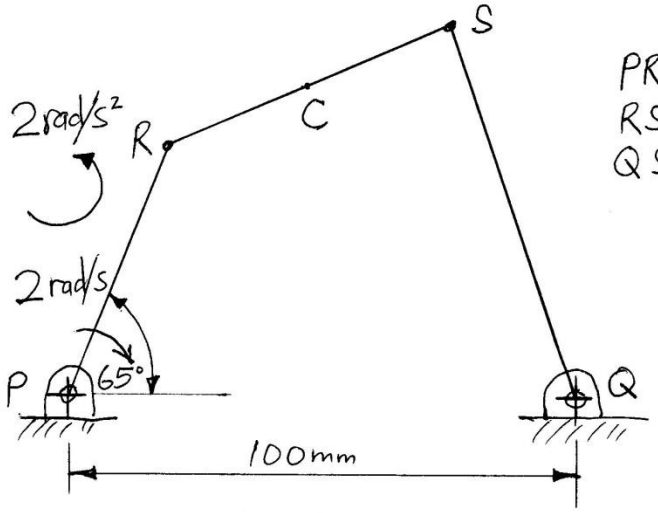


FIG. Q2



PR=50mm
RS=60mm
QS=80mm

Fig. Q3