



# MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

UNIVERSITY EXAMINATIONS 2010/2011  
THIRD YEAR SECOND SEMESTER SUPPLEMENTARY EXAMINATION FOR THE  
DEGREE OF BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING.

**EMG2311: DESIGN OF POWER TRANSMISSION SYSTEMS**

**DATE: MAY, 2011**

**TIME: 2 HOURS**

**INSTRUCTIONS:**

*This paper contains FIVE questions*

*Attempt any THREE.*

*All the questions carry equal marks.*

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Q.1 (a) Show by neat sketches how the following power transmissions can be achieved:

(a) Drive between shafts:

- (i). 125mm centre distance, rotating in opposite directions
- (ii). 240mm centre distance, rotating in the same direction

(b) Parallel shafts:

- (i). 1 m centre distance, rotating in same direction
- (ii). 0.5m centre distance, rotating in opposite directions
- (iii). Motion between two shafts which are neither in the same plane nor do their axes intersect

Q2. (a) How is helical gear better than spur gear? Explain and give reasons.

(b) A spur gear transmission system is to be manufactured to repair a lathe machine. The shafts to be connected have 136mm centre distance and the module to be used is 8mm.

Design the following:

- (i) Spur gears, wheel and pinion for the lathe repair

- (ii) If the spur gears are found to be noisy and helical gears are recommended, design the required helical gears.

Q3. (a). Show by neat sketches the relationship between the bottom clearance, and wheel and Pinion of a spur gear.

(b). A helical gear is to be manufactured from mild steel bar of diameter 60mm. If the helix angle is to 22 degrees and the module is to be 6mm. Calculate:

- (i). Circular pitch
- (ii). Pitch circle diameters of wheel and pinion
- (ii). The lead of the gear
- (iii). Axial pitch
- (v). Normal pitch

Q4. Illustrate with neat sketches the following features related to a bevel gear:

- (i). Pitch circle diameter
- (ii). Root circle diameter
- (iii). Cone distance
- (iv). Pitch angle
- (v). Face width

(a) The data given below belongs to a pair of meshing bevel gears:

Shaft angle –  $90^0$   
Number of teeth on wheel – 60  
Number of teeth on pinion- 40  
Module – 10mm  
Addendum – 12m  
Face width –  $\frac{1}{4}$  where C is cone distance

Use the above data to determine the following for the bevel gear to be designed

- (i). Wheel apex distance
- (ii). Wheel and pinion pitch circle diameters
- (iii). Face angle
- (iv). Back angle

Use neat sketched to illustrate the above features

Q5. Explain with the help of neat sketches how the following torque transmitting elements are used:

- (i). Feather
- (ii). Gibhead
- (iii). Square jaw clutch

(b) Design a clamp muff coupling to transmit 36Kw at 120 rpm. The allowable shear stress for the shaft and key material is 42Mpa and the number of bolts connecting the two halves are six

The permissible tensile strength for the bolts is 72Mpa

Coefficient of friction = 0.3