TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING
(DME Y1 S2)

EME 2152
MECHANICAL ENGINEERING SCIENCE

END OF SEMESTER EXAMINATIONS
SERIES: APRIL/MAY, 2014
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

-This paper contains **FIVE** questions
-Question *ONE* is *COMPULSORY.*
-Attempt any other *TWO* questions.
This paper consists of **3 PRINTED** pages

QUESTION ONE (COMPULSORY)

(a) Three cords, A, B and C are attended to one another at a point O. The angle between cords A and B is 80° and that between B and C is 150°.

If the force exerted by cord A is 100 N. Determine graphically the values of the forces exerted by cords B and C **(10 marks)**

(b) A casting of mass 50 kg is pushed along level ground by a force at an angle of 20° (downwards) to the horizontal. Determine this force if the coefficient of friction between casting the flow is 0.4 **(8 marks)**

(c) A body is fixed vertically upwards with initial velocity 147 m/s.

Determine:

(i)   how far will it rise
(ii)   how long will it take reach maximum height.
(iii)   the time taken before it strikes the ground again
(iv) the velocity it will strike the ground. **(12 marks)**

QUESTION TWO

(a) A force of 930 N acts on a pillar in a direction due N. A force of 300 N on the same pillar acts 30° W of N. Determine the magnitude and direction of the resultant force. **(8 marks)**

(b)   (i)   State the triangle of forces theorem.
        (ii)   The following horizontal forces at point

                20 N in direction due North
                30 N in direction 20 South of East
                10 N in direction South-West
                16 N in direction 5° South West

                Determine the value and direction of the resultant force graphically.   **(12 marks)**

QUESTION THREE

(a) Show that
$$V = \omega r$$
(6 marks)

(b) (i) A piston moves from rest to a speed of 5 m/s in one twenty-fifth of a second. Determine the averages acceleration and distanced travelled.

(ii) A pulley, 800 mm diameter, rotates at 200 rev/min. Determine

(I) the angular velocity
(II) the linear speed of a point on the rim in metres/second. **(14 marks)**

QUESTION FOUR

(a) The constant Oil pressure on one side of the piston of a servo-motor is 6 MN/m^2. The piston area is 20 cm^2. The average power developed is 1.9 KW. Determine;

(i) the work done in moving the piston 25 mm.
(ii) the time taken for the piston to transverse 25 mm. **(10 marks)**

(b) A girder is pulled along a horizontal floor by a rope at 45° to and above the floor. The pull in the rope is 1.5 KN. Determine the coefficient of friction between girder and floor, as the mass of the girder is 250 kg. **(10 marks)**

QUESTION FIVE

(a) A motor can travel at 50 km/h on dry level surface should be able to stop in 14 m.

Determine

(i) Its value and the corresponding braking time
(ii) The distance travelled during the first second after the application of the practices
(8 marks)

(b) Three horizontal wires are attached to the top of the vertical pillar of a jib crane. The directions and magnitudes of the pulls in the wires are as follow; 2.5 KN due W; 2.25 KN due N; 2 KN SW

Determine the magnitude and directions of the pull in a horizontal. Coble attached to the same point required to balance these forces graphically. **(12 marks)**