



## Engineering Science N3

### HYDRAULICS

#### QUESTION 1: HYDRAULICS

- 1.1 A diesel generator with an output power of 5 kW drives a single-acting pump. The pump delivers 80 000 litres of water per hour. The tank is 20 m vertically above the pump.

Calculate the following:

- 1.1.1 The pressure exerted by the pump in kPa  
1.1.2 The work done by the pump per hour  
1.1.3 The efficiency of the pump

(3 × 2) (6)

- 1.2 The following data refers to a hydraulic press:

Diameter of the plunger = 50 mm  
Diameter of ram = 0,2 m  
Stroke length of plunger = 70 cm  
Effort on the plunger = 310 kN

Calculate the following:

- 1.2.1 The force exerted by the ram  
1.2.2 The distance moved by the ram per stroke of the plunger  
1.2.3 The number of pumping strokes required by the plunger to lift the load to a height of 46 m

(3 × 2) (6)

**[12]**

**CENTRAL OFFICE**

16 Market Street  
Private Bag X9674  
0700 POLOKWANE  
Tel: (015) 230 1800  
Fax: (015) 291 2767

**POLOKWANE CAMPUS**

C/o Dorp & College Streets  
0699 POLOKWANE  
Tel: (015) 283 3300  
Fax: (015) 297 2183

**SENWABARWANA CAMPUS**

Senwabarwana Main Street  
0790 SENWABARWANA  
Tel: (015) 505 3172  
Fax: (015) 505 3174

**SESHEGO CAMPUS**

1919 Freedom Drive  
0742 SESHEGO  
Tel: (015) 223 9600  
Fax: (015) 223 5187

## QUESTION 2: HYDRAULICS

- 2.1 Name TWO elementary experiments dealing with pressure in liquids. (2)
- 2.2 A vegetable farmer builds a dam and he uses of a centrifugal water pump for irrigation. The diameter of a piston of a water pump is 182 mm and the stroke length is 192 mm. The effective force on the piston is 6,8 kN during the stroke.
- Calculate the following:
- 2.2.1 The pressure during the working stroke
- 2.2.2 The volume of water delivered during 10 strokes
- 2.2.3 The work done per 10 strokes (3 × 2) (6)
- 2.3 Make a neat, labelled sketch to illustrate the application of Pascal's law and briefly explain its application. (3)
- [11]

## QUESTION 3: HYDRAULICS

- 3.1 Explain the following terms:
- 3.1.1 Pressure at a point
- 3.1.2 Total pressure (2 × 1) (2)
- 3.2 The effective pressure in a single-acting piston pump installation is 550 kPa during a delivery stroke. The piston diameter of the pump is 150 mm and its stroke length is 250 mm.
- Calculate the following:
- 3.2.1 The volume of water in m<sup>3</sup> displaced during the delivery stroke
- 3.2.2 The work done during the delivery stroke (2 × 2) (4)
- 3.3 Illustrate by means of a sketch the following terms with reference to a centrifugal pump:
- Suction head; static head; and delivery head (6)
- [12]

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## QUESTION 4: HYDRAULICS

- 4.1 Explain the following terms:
- Absolute pressure
  - Gauge pressure
- (3)
- 4.2 The ram of a hydraulic jack is 100 mm in diameter. The diameter and stroke of the plunger are 20 mm and 50 mm respectively.  
Determine the following:
- 4.2.1 The force that must be applied to the lever to lift a load of 2,3 tons if the efficiency is 85%. (3)
- 4.2.2 The number of strokes of the lever to lift the load 126 mm. (3)
- 4.3 The following data were given: An inside diameter of the water pipe is 50 mm and an effective head is 30 m. 50
- Calculate the work done. (3)
- [12]**

Compiled by Ayeni MI

Discussion to this question will start at 10:00 ,16/04/2020

Solution will be available on the WhatsApp and college Facebook on the 16/04/2020

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