

National Exams May 2012

04-Agric-B5, Power Units for Agricultural, Biosystems

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is an OPEN BOOK EXAM.
A Casio or Sharp approved calculator is permitted.
3. Four (4) questions constitute a complete exam paper.
The first four questions as they appear in the answer book will be marked.
4. Each question is of equal value.
5. All questions require calculation.

Problem 1

a) Assume that you have a fan and an electric motor, but no pulleys. The fan is designed to operate at 500 rpm, and the electric motor operates at 1725 rpm. What sizes of fan Pulley will be needed to operate the fan? Assume the motor pulley is 6.5 cm. What is the ratio of the pulleys diameter and the pulleys speed?

b) A hydraulic pump will be powered by a tractor power take-off(PTO). The pump must turn 2100 rpm, and the PTO operates at 540 rpm. What sizes of sprockets are needed? Assume an 18-tooth sprocket for the pump.

Problem 2

Determine the indicated engine power for an engine in units of KW, that has a mean effective pressure of 1050 kPa. The engine is a four stroke cycle engine and has three cylinders. The bore(B) is 109 mm, the stroke (S) is 115 mm and the speed is 3000 rpm. Calculate the compression ratio for the engine if the clearance volume is 0.063124 L

Problem 3

Determine the sound dose for an individual who was subject to a sound of 55 dBA for 1.25 hour and a level of 105 dBA for 5 minutes

Problem 4

How much usable power is available if the basic engine rating is 75 hp and the engine will use a fan and a radiator for cooling? Assume derating 10% for the accessories and 5% for the fan.