



Uva Wellassa University, Sri Lanka
BTech Science and Technology
BSc in Computer Science and Technology
End Semester Examination - Semester 1
January 2009
SCT 262-3 Engineering Physics



Instructions

Answer for All questions

No. of questions: Six (06)

No. of pages: Four (04)

Time: Three hours

Clearly state any assumptions made.

You can assume any missing data.

Tables of properties are provided in the exam hall

Question 01

- (a) Briefly discuss about the characteristics of the conventional stress – strain curve of commonly used engineering materials.
- (b) Link BD (Fig Q1(b)) consists of a single bar 30 mm wide and 12 mm thick. Knowing that each support is pin support, determine the maximum value on the average normal stress in link BD if (a) $\theta = 0$, (b) $\theta = 90^\circ$.

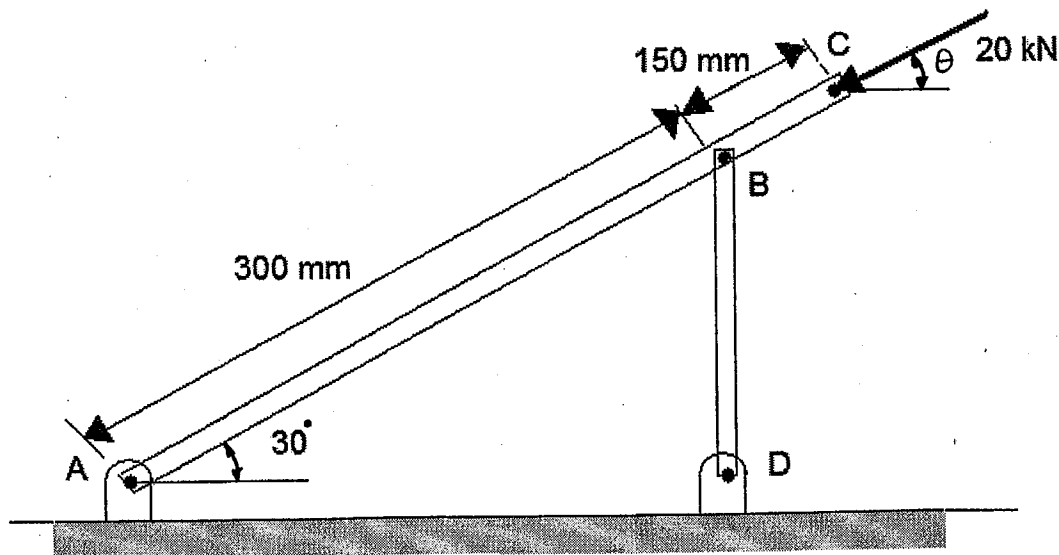


Fig Q1(b)

Question 02

(a) Write short notes on the following topics.

- I. Bernoulli equation
- II. Laminar flow
- III. Turbulent flow
- IV. Absolute, gauge and vacuum pressure

(b) An inverted U tube differential manometer is used to measure pressure difference in an inclined water pipe (Fig Q2 (b)). Calculate the pressure difference between points A and B when $h_1 = 1\text{ m}$, $h_2 = 1.3\text{ m}$ and $h_3 = 0.3\text{ m}$. The manometer fluid is oil of specific gravity 0.7.

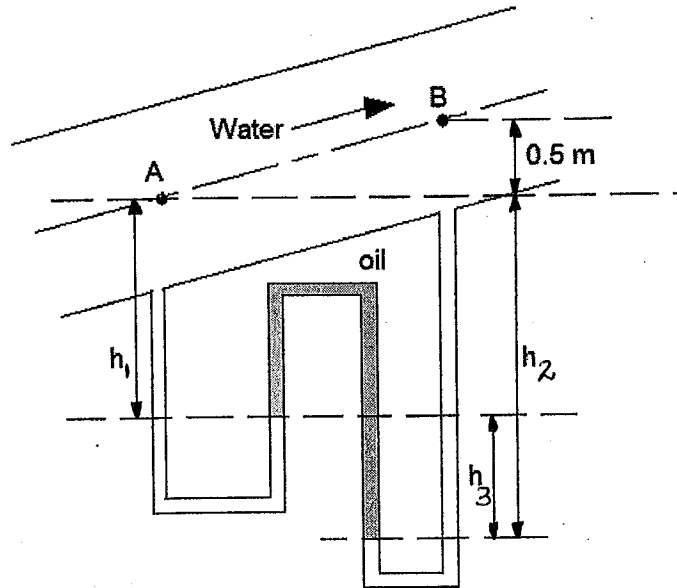


Fig Q2 (b)

Question 03

(a) Consider two closed systems A and B. System A contains 3000 kJ of thermal energy at 20°C whereas system B contains 200 kJ of thermal energy at 50°C . Now the systems are brought into contact with each other. Determine the direction of any heat transfer between the two systems.

(b) The properties of a closed system change following the relation between pressure and volume as $pV = 3.0$ where p is in bar and V is in m^3 . Calculate the work done when the pressure increases from 1.5 bar to 7.5 bar.

(c) A vessel having a capacity of 0.05 m^3 contains a mixture of saturated water and saturated steam at a temperature of 245°C . The mass of the liquid present is 10 kg. Find the following:

- I. The pressure
- II. The mass
- III. The specific volume
- IV. The specific enthalpy
- V. The specific internal energy

Question 04

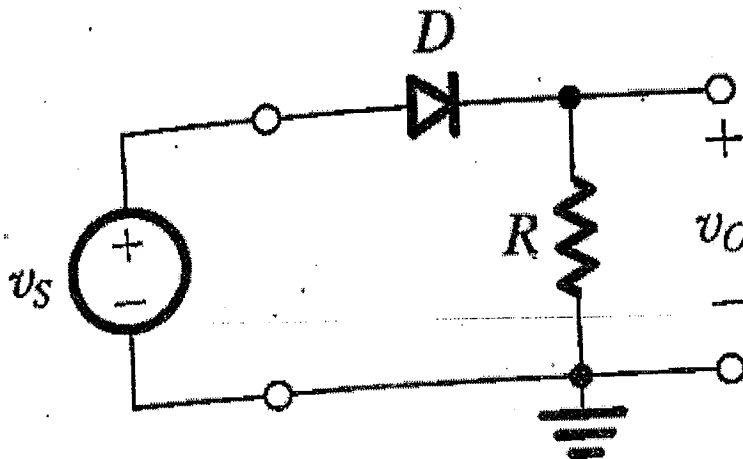
- (a) State Thevenin's theorem.
- (b) A Wheatstone bridge ABCD is arranged as follows. $AB=100\Omega$, $BC=99\Omega$, $CD=1000\Omega$ and $DA=1000\Omega$. A battery of e.m.f. 10V and negligible internal resistance is connected between A and C with A positive. A galvanometer of resistance 100Ω is connected between B and D. Determine galvanometer current using Thevenin's theorem.
- (c) For the above circuit determine galvanometer current using Norton's theorem.

Question 05

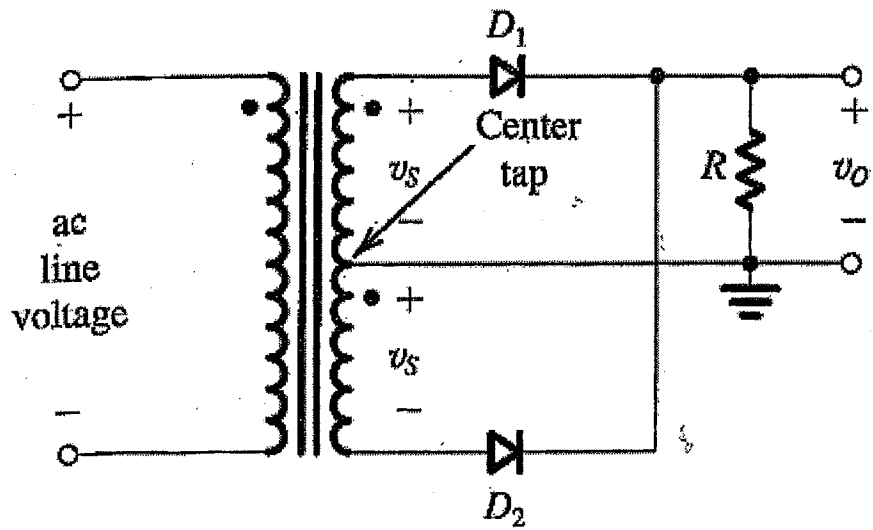
- (a) What is armature reaction of a generator?
- (b) Draw circuit diagrams of
a) Series generator
b) Shunt generator
- (c) The resistance of field circuit of a shunt-excited d.c. generator is 200Ω . When the output of the generator is 100 kW, the terminal voltage is 500V and generated e.m.f. 525V. Calculate,
a) The armature resistance.
b) The value of generated e.m.f. when the output is 60kW and the terminal voltage is 520V.

Question 06

- (a) Write down diode equation.
- (b) Prove that a real diode can be modeled by an ideal diode in series with a voltage source.
- (c) According to the diode model described in part 2, draw the expected output of following circuit.



(d) Draw the waveform of the expected output of following circuit



(e) Explain how a Bipolar Junction Transistor (BJT) can be used as a dark detector along with a Light Dependent Resistor (LDR). Draw the complete circuit diagram.