

GENERAL ENGINEERING SCIENCE II

Attempt ALL questions

Marks for each part question are shown in brackets

1. (a) State the THREE modes of heat transfer. (3)
(h) Give ONE example of EACH of the three modes of heat transfer. (3)

2. A copper vessel of mass 2 kg contains 6 kg of water. The initial temperature of the vessel and water is 20°C and the final temperature is 90°C.

Calculate how much heat energy was added, assuming that heat losses are negligible, giving your answer in kJ. (6)

*The specific heat capacity of copper is 0.394kJ/kgK
The specific heat capacity of water is 4.193 kJ/kgK*

3. With regard to combustion in boilers and internal combustion installations, explain EACH of the following:

- (a) the meaning of excess air supply; (3)
(b) the reason for always providing excess air; (4)
(c) the effects of an inadequate air supply. (3)

4. An oil engine develops indicated power of 52 kW. The brake specific fuel consumption is 0.37kg/kWh and the mechanical efficiency is 88 per cent.

Calculate EACH of the following:

- (a) the brake power; (4)
(b) the fuel consumption per hour. (4)

5. (a) Sketch a simple vapour compression refrigeration circuit, labelling the principal components. (4)

(b) Describe what happens to a refrigerant in a vapour compression circuit as it passes through EACH of the following:

- (i) the condenser; (2)
(ii) the regulator or expansion valve; (2)
(iii) the evaporator. (2)

6. A thermometer at the sub-zero temperature of -18°C contains 300 mm³ of alcohol. The coefficient of cubical expansion of alcohol is $10.8 \times 10^{-4}/^{\circ}\text{C}$.

Calculate the volume of the alcohol when the temperature is increased to 25°C. (10)

7. An electrical circuit with two resistors connected in parallel is shown in Fig. Q.7.

Calculate EACH of the following:

(a) the value of current flowing through each resistor; (6)

(b) the resistance of R_2 . (2)

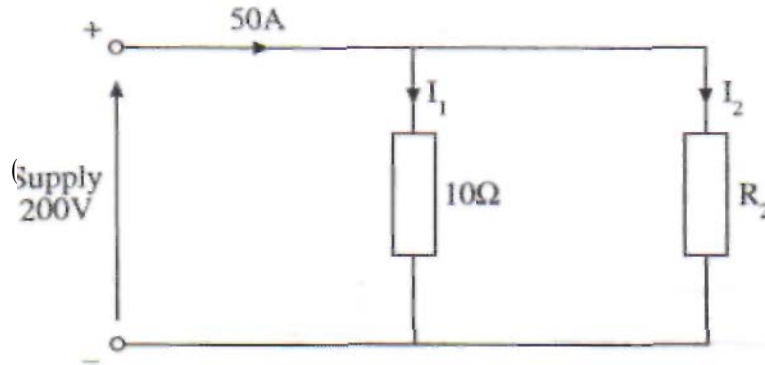


Fig. Q.7

8. The resistance of a coil of wire at the start of a heat test is 250Ω when its temperature is 15°C . At the completion of the test the resistance is 275Ω . The temperature coefficient of resistance of the wire at 0°C (α_0) is $0.005 \Omega/\Omega/^\circ\text{C}$.

Calculate the temperature of the coil at the completion of the test. (10)

9. (a) Sketch a lead acid cell labelling the parts. (3)

(b) Describe the chemical action while the cell is being charged. (3)

10. Sketch the magnetic flux distribution for EACH of the FOUR examples of magnets depicted on Worksheet Q.10. (8)

11. A rectangular coil wound with 80 turns of wire has a mean width of 40 mm and an effective length of 100 mm. The coil, carrying a current of 6 A, is placed in a uniform magnetic field of flux density 0.15 Tesla.

Calculate EACH of the following:

(a) the force acting on one side of the coil; (4)

(b) the maximum torque on the coil. (4)

12. (a) Sketch a moving coil instrument, labelling the component parts. (5)

(b) Describe how the instrument sketched in Q. 12(a) operates. (5)

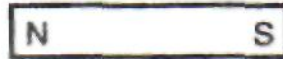
WORKSHEET Q.10

(N.B. This Worksheet must be returned with your answer book)

1.



2.



3.



4.

