Name.....
Roll No.....

DEPARTMENT OF ELECTRCAL ENGINEERING
National Institute of Technology Calicut
END SEMESTER EXAMINATION-DECEMBER 2013

ZZ 1003: Basic Electrical Sciences (Electrical)

Total Time for Electrical and Electronics: 3 hours. Maximum: 25 Marks

Answer all questions

1. Using mesh analysis, find the current i_x in the circuit shown in Fig. 1. **(2.5 marks)**

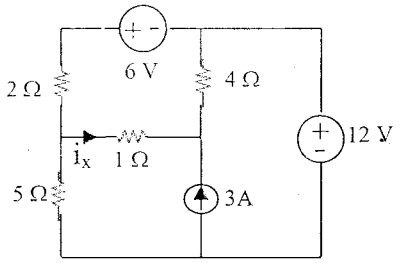


Fig.1

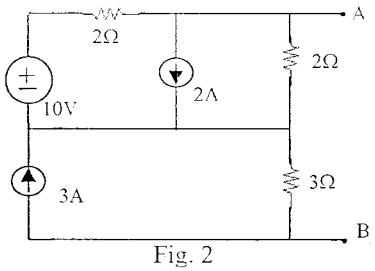


Fig. 2

2. Using superposition theorem, find the voltage across A and B. for the circuit shown in Fig.2. **(2 marks)**

3. In the circuit shown in fig.3 what value of R_L will absorb maximum power? Also find the maximum power absorbed by R_L. **(3 marks)**

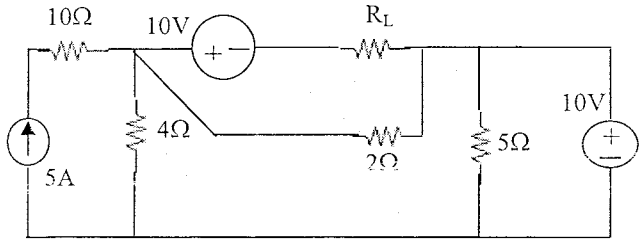


Fig. 3

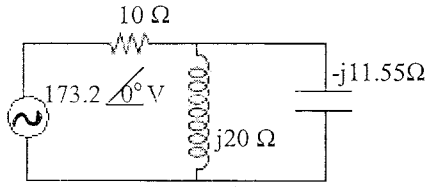


Fig. 4

4. Two coils A and B of 600 and 100 turns respectively are wound uniformly around a wooden ring of mean circumference 80 cm. The cross sectional area of the ring is 4 cm^2. Calculate (a) self inductance of each coil (b) mutual inductance between the coils (c) emf induced in coil B when a current of 2 A in coil A is reversed in 0.01 second. **(3 marks)**

5. A parallel plate capacitor has its plates separated with a slab of 4 mm thickness having relative permittivity 3. If the capacitance is observed to be one third of the original value, when a second slab of 6 mm thickness is inserted in series with the first slab, what should be the relative permittivity of the second slab. **(2 marks)**

6. Calculate the rms value and the form factor of a symmetric alternating voltage signal v(t) which increases linearly from 0 to 200 V in the first millisecond, holds at 200 V for the next 2 milliseconds and then decreases linearly to 0 V in the fourth millisecond of its +ve half cycle. **(2 marks)**

7. For the circuit shown in Fig.4, evaluate the current through and voltage across each element. Draw the phasor diagram. **(3 marks)**

8. The potential difference measured across a coil is 20 V with a direct current of 2A and it is 140 V with an alternating current of 2A at 40 Hz. If the coil is connected to a 230 V 50 Hz supply, calculate (a) the current (b) the active power (c) the reactive power and (d) the power factor. **(3 marks)**

9. The sinusoidal current through a circuit with a supply voltage of $100\angle 0^\circ$ V at 50 Hz is given by (3+j4)A. If the circuit comprises of two elements, identify the elements and their values. **(2 marks)**

10. Three alternating quantities are given as A= 40 sin(ωt), B= 60 sin(ωt-π/2) and C = (10sinωt-17.3cosωt). Draw a phasor diagram showing the above three quantities taking sin(ωt-π/6) as the reference. Find the resultant and express the resultant in exponential form. **(2 marks)**

11. An alternating current is represented by i = 12 + 100 sin(628t+30)A. Find the time taken for the current to reach a value of 80 A for the first time. **(0.5 mark)**

National Institute of Technology Calicut

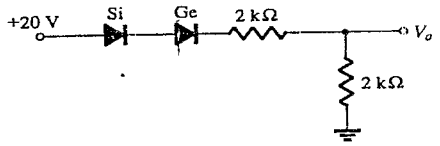
Department of Electronics and Communications Engineering

End Semester Examination (Monsoon 2013)

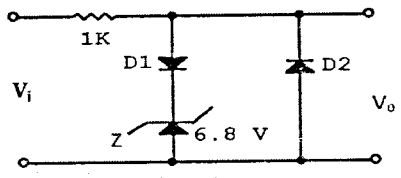
ZZ1003- Basic Electrical Sciences (Electronics Part)

Time: 1.5 hours | Answer All Questions | Max. Marks: 25

1. Determine the level of V_0 for the network (consider diode drops) [2 Marks]

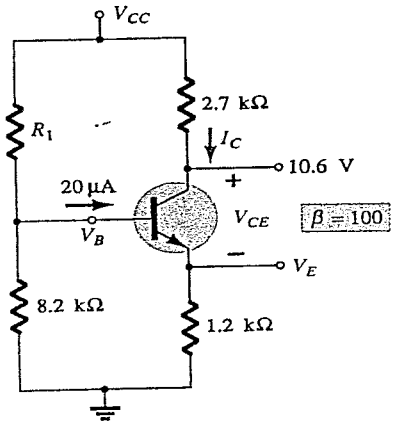


2. In the following circuit, an input voltage $V_i = 10\sin(100\pi t)$ is applied. Assume that the diode drop is 0.7 V when it is forward biased. The Zener breakdown voltage is 6.8V. Find the maximum and minimum values of output voltage. [2 Marks]

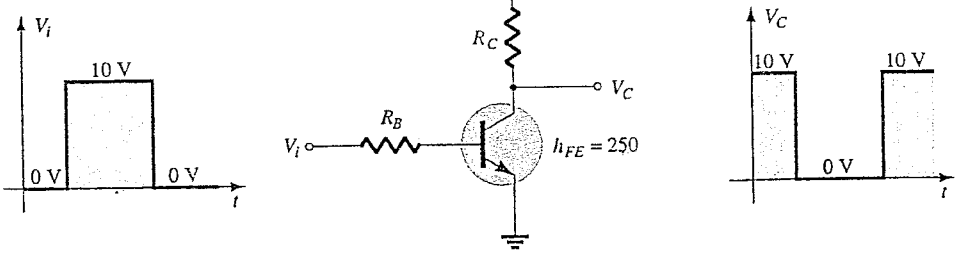


3. Determine the given parameters for the circuit shown in figure below [3Marks]

(a) I_C
(b) V_E
(c) V_{CC}
(d) V_{CE}
(e) V_B
(f) R_1



4. Determine R_B and R_C for the circuit shown in figure, If I_{Csat}=10 mA. [2 Marks]



5. In each case of the following operations determine the base of the numbers so that the given expressions are true [2 Marks]

   (a) 14/2 = 5 (b) 24 + 17 = 40.

6. Perform subtraction on the given binary numbers using the 2's complement [2 Marks]

   (a) 10011-10010 (b) 100010-100110

7. Simplify the following expressions using K-map [3 Marks]

   (a) $\sum$ (9, 10, 12) & d (3, 5, 6, 7, 11, 13, 14, 15)

   (b) $\prod$ (1, 4, 5, 11, 12, 14) & d (6, 7, 15)

8. Implement the following four Boolean expressions with three half adders: [2 Marks]

$$D = A \oplus B \oplus C$$
$$E = A'BC + AB'C$$
$$F = ABC' + (A' + B')C$$
$$G = ABC$$

9. Implement the Boolean function [2 Marks]

   $F = xy + x'y' + y'z$

   (a) With NAND and inverter gates

   (b) With NOR and inverter gates

10. Design a combinational circuit that takes 2-bit number $X=X_1X_0$, and computes the square of that number $Y=X^2$ (Eg: if X = 10 then Y = 0100). [3 Marks]

11. Explain the function of horizontal and vertical deflection plates in Cathode Ray Oscilloscope [2 Marks]