



THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
DIPLOMA IN TECHNOLOGY



ECX 3234 - Electrical Technology
Final Examination 2007/2008

Date: 03-05-2008

Time: 09.30-12.30

Answer 5 questions.

Select atleast 3 questions from Section A and atleast 1 question from Section B.

Section A

- Q1. (a) Define "voltage regulation" and "efficiency" of a short transmission line. (3 marks)
- (b) A 3-phase, 50 Hz, transmission line having resistance of 5Ω per phase and inductance of 30 mH per phase supplies load of 1000 kW at 0.8 lagging and 11 kV at the receiving end.
- Find,
- Sending end voltage and power factor (6 marks)
 - Transmission efficiency (4 marks)
 - Voltage regulation (2 marks)
 - What would be the reduction in the line loss if the power factor of the load were improved to unity? Also find the new transmission efficiency. (5 marks)
- Q2. (a) Explain the conditions that must be satisfied to operate two 3-phase transformers in parallel. (4 marks)
- (b) Explain the meaning of term 41-Dy-11 with respect to 3-phase transformer. (4 marks)
- (c) A 3-phase star (Y) connected load of 2000 kVA, 0.8 power factor lagging is fed by a 3-phase 33 kV/6.6 kV, Y-Y transformer. The transformer is supplied from a 3-phase star connected source through a 3-phase feeder whose impedance is $(8+j10) \Omega$ per phase. The per phase impedance of the transformer primary and the secondary are $(7.5+j13.2) \Omega$ and $(0.35+j0.65) \Omega$ respectively, as referred to their own sides. Determine the required supply voltage if the load voltage is 6.6 kV. (12 marks)

- Q3. (a) Why is it necessary to short-circuit the secondary of a current transformer when the instrument is to be taken out of circuits? (4 marks)
- (b) What are the advantages & disadvantages of an auto transformer, when compared with two winding transformer. (4 marks)
- (c) A 400/100 V, 5 kVA, single phase two winding transformer to supply 400 V from a 500 V voltage source.
- Determine its kVA rating as an auto transformer. (4 marks)
 - Calculate the transformed kVA and conducted kVA. (4 marks)
 - Calculate the economy of copper in the particular case. (4 marks)
- Q4. (a) State the important factors affecting the selection of industrial drives. (4 marks)
- (b) What are the different methods of speed control of a dc motor? Why is it dangerous to uncouple the mechanical load of a dc series motor? (4 marks)
- (c) Why is the electric braking of electric motors superior to mechanical braking? Explain the method of dynamic braking of a dc motor. (4 marks)
- (d) Select suitable electric motors for the following industrial applications. Justify your answers with their characteristics.
- Traction works
 - Lathes
 - Coil winder
 - Pumps (8 marks)
- Q5. (a) Discuss the classes of insulating materials and their hottest spot temperature. (4 marks)
- (b) Give reasons as to why the hottest spot temperatures are higher than the values measured by conventional measuring instruments. (4 marks)
- (c) Briefly explain the basic types of transformer cooling. (4 marks)
- (d) What are the properties should a good transformer oil possess? (4 marks)
- (e) Discuss the construction and operation of an "Insulation megger". (4 marks)

Section B

- Q6. (a) Draw the V-I characteristics of practical diodes, indicate typical values. (5 marks)
 (b) List three applications of semiconductor diodes. (5 marks)
 (c) Sketch the output waveform of the circuit shown in figure Q6. Show important values clearly. (10 marks)

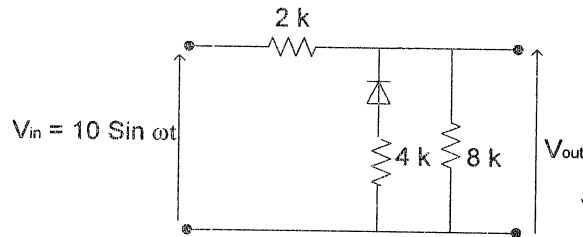
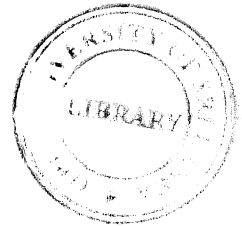


Figure Q6



- Q7. (a) List advantages and disadvantages of FET transistors when compared with BJT transistors. (5 marks)
 (b) Sketch the I_D - V_{DS} characteristics for n-channel JFET transistors. (5 marks)
 (c) Determine the bias point voltages of the JFET amplifier shown in figure Q7. (assuming $I_{DSS}=5$ mA and $V_P=-6$ V). (5 marks)
 (d) Calculate the mid band voltage gain of the given amplifier. (5 marks)

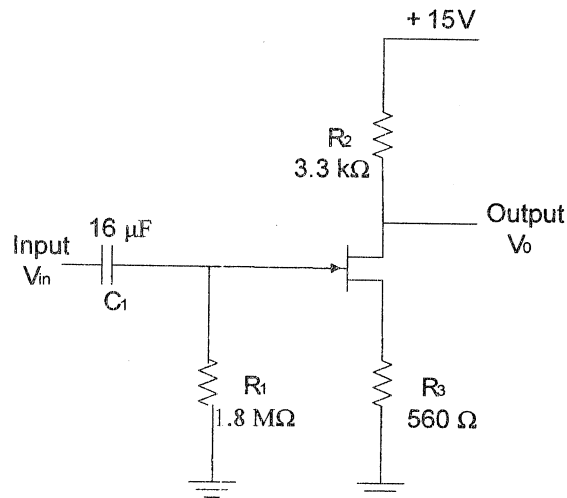


Figure Q7

Q8.

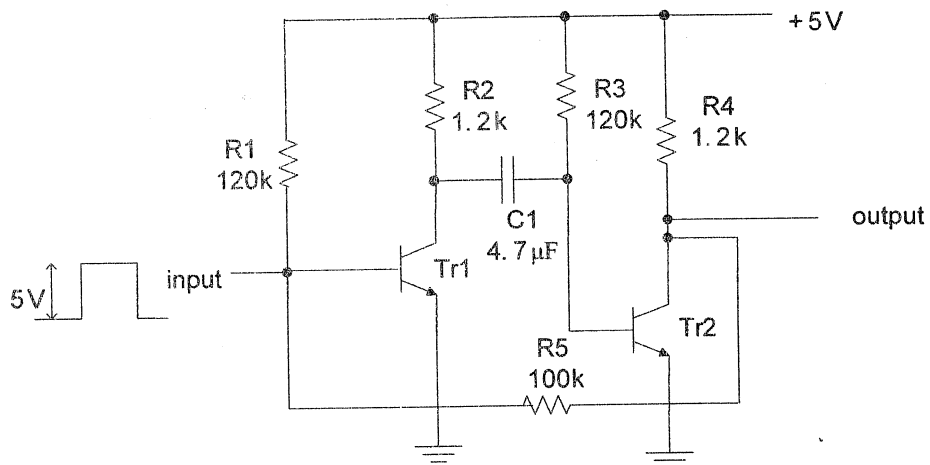


Figure Q8

- (a) State the purpose of the circuit given in the figure Q8. (4 marks)
- (b) Identify the transistor(s) which is turned on when the input voltage is zero. (3 marks)
- (c) With the help of an appropriate timing diagram, briefly explain what will happen to the circuit when 5 V pulse is applied to the input. (8 marks)
- (e) What are the parameters that you should consider when selecting transistor Tr2 ? (5 marks)