



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

EED 218: ELEMENTS OF POWER SYSTEMS I

DATE: 8/5/2019

TIME: 2.00-4.00 PM

INSTRUCTIONS:

This paper consists of FIVE Questions. Answer Question ONE and ANY OTHER TWO questions.

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) State six factors to consider for site selection of hydropower plant. (3 marks)
- b) With an aid of diagram, explain load curve and load factor. (4 marks)
- c) A hydro power plant operates an effective head of 100 M and a discharge of $200 \text{ m}^3/\text{sec}$.
If the efficiency of the turbine is 0.9, find the power developed (3 marks)
- d) Define Kelvin's law in power system. (1 mark)
- e) Define corona and explain its effect. (2 marks)
- f) With an aid of well diagram explain four parameters of transmission line (4 marks)
- g) Given the following data of a power supply agency;

Sr.No.	Particulars	Domestic Load	Commercial Load	Industrial Load	System Diversity Factor
1	Maximum Demand	20000kW	20000 kW	50000 kW	1.6
2	Diversity Factor	1.5	1.4	1.2	
3	Demand Factor	0.7	0.8	0.9	

Find the following

- i. Maximum demand. (1 mark)
- ii. Connected load of Domestic, Commercial and Industrial Load. (4 marks)
- h) Enumerates advantages and disadvantages of diesel power plant. (8 marks)

QUESTION TWO (20 MARKS)

- a) State and explain five factors affecting cost of power generation. (10 marks)
- b) With the aid of a well labeled diagram, state and explain elements of an excitation system (10 marks)

QUESTION THREE (20 MARKS)

- a) Define diversity factor. (2 marks)
- b) State four classifications of power generation stations. (3 marks)
- c) With the aid of a well labeled diagram, explain components of hydropower plants. (10 marks)
- d) State five factors to consider for site selection of nuclear power plants. (5 marks)

QUESTION FOUR (20 MARKS)

- a) Find out the specific speed of a turbine of 20 MW capacity working under a head of 400 M and having the normal working speed of 300 RPM. (3 marks)
- b) State types of excitation systems (3 marks)
- c) State five advantages of nuclear power plants (5 marks)
- d) Define economics of power generation. (1 mark)

- e) A run-off-river hydro-electric plant with pondage has the following data:
Installed capacity= 10 MW, water head, $H= 20\text{ M}$, overall efficiency= 80% Load factor =40%.
- i. Determine the river discharge in m^3/sec required for the plant.
 - ii. If on particular day, the river flow is $20\text{ m}^3/\text{sec}$, what is the load factor the load can supply? (8 marks)

QUESTION FIVE (20 MARKS)

- a) State types of hydropower turbines and classify according the head and quantity of water. (6 marks)
- b) With the aid of a well labeled diagram describe the components and operating principle of steam power station (14 marks)