



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

*Department of Electrical and Electronic
engineering*

UNIVERSITY EXAMINATION:

Diploma in Electrical Power Engineering (DEPE 5)

ELECTRICAL POWER SYSTEMS II

EEP 2302

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions;. Attempt any **THREE** Questions.

Do not write on the question paper.

Question ONE

- (a) Distinguish between system and equipment earthing (2 marks)
- (b) Explain why neutral of a high voltage system is usually solidly grounded while that of a medium voltage is grounded through a resistor or tuned reactor. (3 marks)
- (c) With the aid of a diagram explain the method of earthing through a voltage transformer and state its advantages (5 marks)
- (d) A 230 kV, 3-phase, 50 Hz, 200 km transmission line has a capacitance to earth of $0.02\mu\text{F/km}$ per phase. Calculate the inductance and kVA rating of the Peterson coil used for earthing the above system. (10 marks)

Question TWO

- (a) State three ways in which maximum stress on a cable dielectric can be reduced. (3 marks)
- (b) One conductor of a 100KV single core lead sheathed cable having graded insulation has a conductor diameter of 2 cm. The internal sheath radius is 4 cm. The first cm of radial thickness of insulation has a relative permittivity of 3 and that of the remainder is 5. Determine the maximum and minimum values of stress for
- (i) Each dielectric
 - (ii) A homogeneous dielectric
- (17 marks)

Question THREE

- (a) State;
- (i) Four merits of overhead over underground distribution
 - (ii) Three requirements of a distribution system
- (7 marks)
- (b) Explain the use of a synchronous condenser to control the voltage of a transmission line (8 marks)
- (c) State
- (i) The main locations of voltage control equipment
 - (ii) The disadvantages of on load tap changing
- (5 marks)

Question FOUR

- (a) Explain with reference to underground cables ;
- (i) Skin effect
 - (ii) Void formation
 - (iii) Effect of voids
 - (iv) methods used to prevent or delay void formation
- (9 marks)
- (b) Explain graded insulation and why it is used in cables (3 marks)
- (c) A single core lead sheathed cable 5 km long has a conductor diameter of 2.5 cm and an insulation thickness of 1 cm. The insulation is impregnated paper with a resistivity of 5×10^{14} ohm cm and a relative permittivity of 3. Determine the insulation resistance of this cable (8 marks)

Question FIVE

- (a) Describe the symmetrical components theory (5 Marks)
- (b) Explain the need for use of symmetrical components (5 marks)
- (c) In a 3-phase, 4-wire system, currents in R , Y and B lines under abnormal conditions of loading are: $I_R = 150 \angle 45^\circ \text{ A}$; $I_Y = 250 \angle 150^\circ \text{ A}$; $I_B = 100 \angle 300^\circ \text{ A}$

Determine the following components of current in the R- line

- (i) Zero sequence
- (ii) Positive sequence
- (iii) Negative sequence
- (iv) Return current in the neutral

(10 marks)