



- 1- Trust in God ----Be confident ----Be calm
- 2- Exam is not a punishment or a curse.
- 3- It is a chance to show your knowledge
- 4- It is the time to get the prize of your effort

- 5- Important instructions for all students: please read carefully
- 6- The examination consists of 4 questions in 1 paper (2 pages)
- 7- Read the questions carefully before answering.
- 8- Your answer should be short and precise.
- 9- Remember to mark your answers with ordered numbers corresponding to questions.

Answer the Following Questions:

Question (1):

(15 Marks)

- a. Discuss :
1. Fuse coordination 4
 2. Relay classification considering: The construction and function 4
 3. Differential protection 2
- b A 50 mile, 138 KV transmission line is equipped with a distance relay with 600/5 C.T and V.T ratio 138000/115 V. 5
Find the secondary impedance if the line impedance of 0.8 Ω /mile

Question (2):

(15 Marks)

- a What are the factors to be considered while electrical designing the transmission line? How can you improve the performance of it 7
- b A single phase overhead transmission line delivers 1100 kW at 33kV at 0.8 p.f. lagging. the total resistance and inductive reactance of the line are 10 Ω and 15 Ω respectively. Determine: 2
1. Sending end voltage 2
 2. Sending end power factor 2
 3. Transmission efficiency. 2

Question (3):

(15 Marks)

- a **Define:**
1. The dielectric strength of any insulator. 2
 2. Parameters affecting the breakdown strength of insulating materials. 2
 3. The ionization process in gases 2
- b In a non-uniform field, the first ionization coefficient is given as: $\alpha = 10 + 13\sqrt{x}$ cm⁻¹, where the origin is at the Cathode surface. 5
The distance between the two electrodes is 0.7 cm and the pressure

is 1150 torr. Calculate the electric field intensity.

- c The natural rubber has dielectric constant of 6.1 and a loss angle of 4.2° . If this dielectric is subjected to an alternating field of 74 kV/cm at a frequency of 50 HZ. Calculate the heat generated in dielectric. If the maximum heat permissible in this dielectric is 1.2 W/Cm^3 "safety", there is dangerous or not?

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Question (4):

(15 Marks)

- a
1. Explain how can generate the higher voltage with "Cockcroft- Walton voltage multiplier circuit".
 2. State the circuit breaker types according to the medium of medium of arc extinction.

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- b. Calculate the maximum safety multi-core cable length(CU) by using CB, with neutral line. The cable voltage is 415 , the C.S.A of cable is 120 mm² and the C.S.A of neutral conductor is half the line conductor, there are 3 cables besides. The short circuit with magnetic release is 1200 A(take the effect of reactance 0.9).

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V	220	400	415	440	480	500	660
K1	0.58	1.05	1.11	1.16	1.26	1.31	1.73
No. cables	2	3	4	5	6		
K2	2	2.65	3	3.2	3.33		

- Calculate the percentage error with using the approximate earthing rod diameter equation with earthing resistance not greater than 0.215ρ . Take the length of rode 5m, and depth 3.97m.

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Good Luck
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and Committee