

**Kafrelsheikh University**  
**Faculty of Engineering**  
 Department: Electrical Engineering  
 Year: 3<sup>rd</sup> Year Mechanical (R-2007)  
 Subject: Electrical Power Engineering  
 Student name:



**Final Exam- 2<sup>nd</sup> Semester 2017/2018**  
 Time allowed: 3 hours  
 Full Marks: 60  
 Exam Date: 3/06/2018  
 Number of Pages: Two

**Notes: This exam consists (6) problems, Please, solve (5) problems only;**  
**Assume any missing data**

The exam covers ILOs (a.1, a.3, a.4, a.5, b.1, b.2, b.3, b.4, b.5 c.1, c.2, c.3, c.4)

**A Give the reason/s:**

(5M)

- Variable nature of electrical load on power plants
- Corona in high voltage transmission systems
- Importance of diversity factor

**B A 20 kV- 50Hz, short three phase transmission line is 50 km long. The resistance is 0.16  $\Omega$ /km and the inductance 0.15 H/km. Find the voltage, power at the sending end, the voltage regulation and efficiency when the line is supplying a three phase load of 40 MVA at 0.80 pf lag. at 20 kV.** (7 M)

**A Deduce a formula for the efficiency and total conductors' volume in overhead AC three wire supply systems, consider the power received to the far end equals P in (MW) at voltage  $V_m$  in kV between conductors.** (4 M)

(8M)

**B Check the errors for the following statements:**

- 1) Unified grid in Egypt has a voltage level of 120 kV.
- 2) The efficiency of power plant at certain load equals the load power factor.
- 3) The energy produced of a power plant during one day equals to 24 times of rating.
- 4) The transmission lines sag is dependent on towers height and their span.
- 5) Introducing a series capacitor to the transmission line increases the line performance.
- 6) If connected load is 20 MW, power factor is 0.85 then peak load equals 17.
- 7) Increased transmission voltage reduces the power losses and conductor volume.
- 8) The base load of power plant can be defined as the highest load of a plant.

**A Indicate two differences only for each of the following pairs:**

(4M)

- Power factor and efficiency

- DC and AC distribution systems with the same number of conductors

**B The span between the two towers, of height 30 m and 90 m respectively support a transmission line conductor at water crossing, equals 500 m. find the minimum clearance of the conductor kg and weight of conductor equals 1.5 kg/m. find the minimum clearance of the conductor and water and the clearance at the mid-point between supports.**

If the span is increased by 10%, find with suitable comments the % variation in the clearance compared with the base span. (8M)

- A Draw the phasor diagram for nominal  $\pi$ -circuit medium transmission line. (4M)
- B A three-phase 138-kV long transmission line is connected to a 200-MW load at a 0.85 lag. Power factor. The line constants of the 150 km-long line are  $Z = 95 \angle 78^\circ \Omega$  and  $Y = 0.001 \angle 90^\circ \text{S}$ . Calculate the following: (8 M)

- The transmission line performance,
- The general transmission line constants: A, B, C and D.
- Prove that:  $(AD)^2 + (BC)^2 - 1 = 2ABCD$

- A How do you perform the following: (6 M)
- Enhance the string efficiency of suspension insulators.
  - Selection criteria for number and size of generating units
  - Improve transmission lines performance.
- B A 600 m long distributor AB is fed at both sides with the same voltage at 500 V – DC. The concentrated test loads 50, 130, 40 and 125 A are located at points C, D, E and F at 50, 180, 300 and 450 m from end A, respectively. Find: (6 M)
- The voltage drop across each section.
  - The point within the distributor of minimum voltage.
  - The total power losses and the efficiency

- A Mention in brief: (6M)
- Two advantages of DC supply systems.
  - Mechanical design of transmission systems.
  - Two merits of underground cables

- B A power station is supplied a daily load as tabulated as: (6 M)

Times		Load (MW)
From	To	
7 AM	10 AM	2
10 AM	11 AM	2.5
11 AM	12 Noon	4.0
12 Noon	3 PM	3
3 PM	6 PM	2
6 PM	10 PM	1.8
10 PM	12 AM	1.2
12 AM	7 AM	0.8

- Draw the DAILY load curve.
- Find out the load factor, base load, total yearly consumed energy.
- Determine the proper size of generation units and their schedule to fed this load.

With Best regards ..... Dr. Ragab El-Sehiemy