



**SE-6805**

**B. E. III (Sem. V) (Electrical) Examination**

**April / May - 2011**

**Electrical Power System : Paper-I**

Time : 3 Hours]

[Total Marks : 100

**Instructions :**

(1)

नीचे दशांशिक निशानीवाणी विगतो उत्तरवही पर अवश्य कभवी. Fillup strictly the details of signs on your answer book.		Seat No. :	
Name of the Examination :		<input type="text"/>	
<input type="text" value="B. E. 3 (Sem. 5) (Electrical)"/>		<input type="text"/>	
Name of the Subject :		<input type="text"/>	
<input type="text" value="Electrical Power System - Paper-1"/>		<input type="text"/>	
Subject Code No. : <input type="text" value="6"/> <input type="text" value="8"/> <input type="text" value="0"/> <input type="text" value="5"/>		Section No. (1, 2,.....) : <input type="text" value="1&amp;2"/>	
		Student's Signature	

- (2) All questions are compulsory.
- (3) Write both sections in separate answer sheets.
- (4) Draw figures wherever necessary and make necessary assumptions wherever required.
- (5) Figures to right indicate full marks.
- (6) Please write answers in point wise and try to avoid essay type answers.

**SECTION - I**

- 1 (a) Fill in the blanks : 10
- (1) If the conductor size increased, the corona effect is \_\_\_\_\_.
  - (2) The voltage drop in a doubly fed distributor is \_\_\_\_\_ than the equivalent singly fed distributor.

- (3) The rated voltage of a 3-phase power system is given as \_\_\_\_\_ line to line voltage.
- (4) The minimum dielectric stress in a cable is at \_\_\_\_\_.
- (5) For a 3-phase, 4-wire system at \_\_\_\_\_ load, the cable generally used are  $3\frac{1}{2}$  core.
- (6) Belted cables are generally used up to \_\_\_\_\_ kv.
- (7) The higher the transmission voltage, the \_\_\_\_\_ is the conductor material required.
- (8) The economic size of conductor is determined by \_\_\_\_\_.
- (9) In India \_\_\_\_\_ system is adopted for transmission of electric power.
- (10) If the length of a cable is doubled, its capacitance is \_\_\_\_\_.

- (b) (1) What is booster ? With a neat diagram, explain **10** how it can be used on a feeder.
- (2) Compare the volume of conductor material required for a dc 2-wire system and 3-phase, 3-wire system for underground system on the basis of maximum voltage between conductors and same line losses (watts) in both the cases. Make suitable assumption.

**2** (a) State and prove Kelvin's Law for size of conductor for transmission. Discuss its limitations. **7**

(b) A single phase ac distributor AB 300 meters long is fed from end A and is loaded as under : **8**

- (i) 100 A at 0.707 p.f lagging 200 m from point A.
- (ii) 200 A at 0.8 p.f. lagging 300 m from point A.

The load resistance and reactance of the distributor is  $0.2\Omega$  and  $0.1\Omega$  per kilometer. Calculate the total

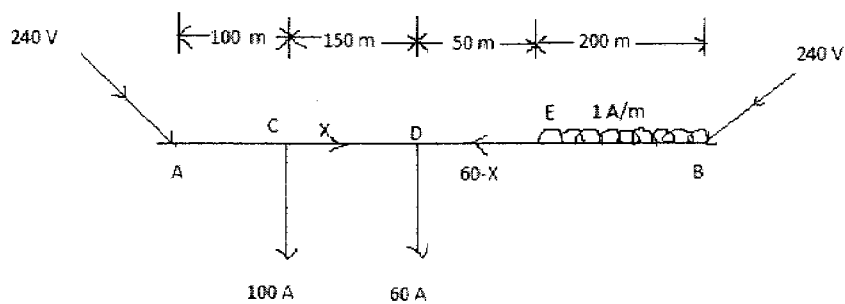
voltage drop in the distributor. The load power factors refer to the voltage at the far end.

OR

- 2 (a) Give the various methods for reducing corona effect and explain the following terms with reference to corona : 7
- (i) Critical disruptive voltage
  - (ii) Visual critical voltage
  - (iii) Power loss due to corona.
- (b) A dc 2-wire distributor AB is 500 m long and is fed at both ends at 240 V. The distributor is loaded as shown in Fig. F. The resistance of the distributor is  $0.001 \Omega$  per meter. 8

*Calculate :*

- (i) the point of minimum voltage and
- (ii) the value of this voltage



**Fig. F**

- 3 Answer any **three** : 15
- (a) Explain various methods of improving string efficiency.
  - (b) Explain the methods used for achieving uniform dielectric stress on the insulation in case of cable.
  - (c) Derive an expression for the voltage drop for a uniformly loaded distributor fed at one end.
  - (d) State the advantages and limitations of high voltage power transmission.
  - (e) A transmission line has a span of 200 meters between levels supports. The conductor has a cross-sectional area of  $1.29 \text{ cm}^2$ , weighs  $1170 \text{ kg/km}$  and has a breaking stress of  $4218 \text{ kg/cm}^2$ , calculate the sag for a safety factor of 5, allowing a wind pressure of  $122 \text{ kg per square meter}$  of projected area. What is the vertical sag ?

#### SECTION - II

- 4 (a) Fill in the blanks : 5
- (1) If the supply frequency increases, then skin effect \_\_\_\_\_. (increases/decreases/remains the same)
  - (2) If the power factor of the load decreases, the line losses \_\_\_\_\_. (increases/decreases/remains the same)
  - (3) If the conductor diameter decreases, then inductance of the line \_\_\_\_\_. (increases/decreases/remains the same).
  - (4) Transposition of a three-phase transmission line helps in equalizing \_\_\_\_\_ and \_\_\_\_\_ of the three-phases. (resistance/inductance/capacitance/power factor)
  - (5) In the transmission line,  $AD - BC = \underline{\hspace{2cm}}$   
(1, -1, 0)

(b) Match the following : 5

Group A	Group B
(1) Stranded conductors	(a) Remains independent of the line length
(2) Surge impedance of a transmission line	(b) Reduces with line length
(3) Inductance of the line	(c) Increases with the spacing between the conductors
(4) Medium transmission line	(d) Capacitance is taken into account
(5) Line losses in transmission line	(e) Increases with load power factor
	(f) Composite conductors

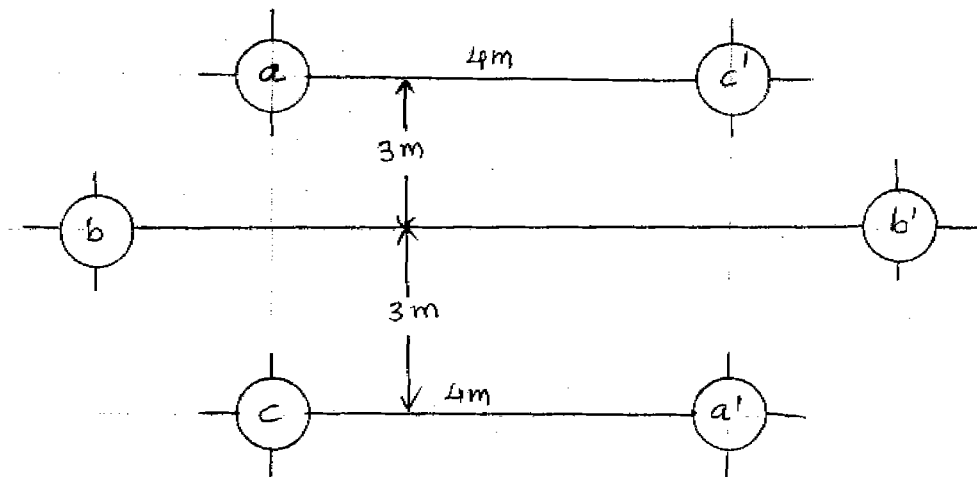
(c) Give reasons for the following : 5

- (a) ACSR conductors are preferable to aluminium conductors.
- (b) Receiving end voltage is more than the sending end voltage for a lightly loaded transmission line.
- (c) Composite conductors are used in over head transmission line.
- (d) A synchronous motor is used as a voltage control device.
- (e) A three-phase balanced system is analyzed on single phase basis.

5 (a) Derive an expression for inductance per phase for a three-phase line with, 8

- (i) Symmetrical spacing
- (ii) Unsymmetrical spacing arranged with regular transposition.

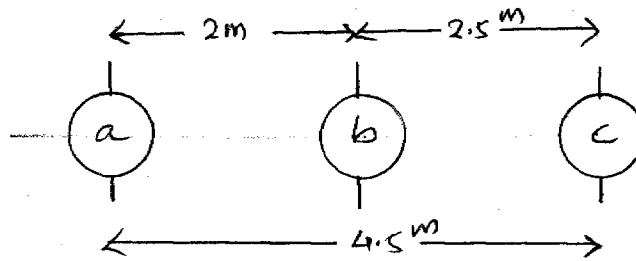
- (b) Find the inductance per phase per kilometer of double circuit, three-phase line shown in **fig. 1**. The conductors are transposed and are of radius 0.75 cm each. The phase sequence is ABC. 7



**Fig. 1**

**OR**

- (b) A three-phase 50 Hz, 66 kV over head line conductors 6  
 are placed in a horizontal plane as shown in **Fig. 2**.  
 The conductor diameter is 1.25 cm. If the line length is  
 100 kilometer calculate,  
 (a) Capacitance per phase  
 (b) Charging current per phase  
 Assume complete transposition of the line.



**Fig. 2**

**6** Attempt any **three** :

**18**

- (1) Explain the term-self GMD and mutual GMD.
- (2) Evaluate the generalized circuit constants for - short transmission line and medium transmission line.
- (3) Explain briefly the 'Skin Effect' in a transmission line. On what factor does it depend ?
- (4) Write short note : Transposition of transmission line.
- (5) Explain : Tuned power lines.

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