

**III B.Tech II Semester Supplementary Examinations,
November/December 2005
POWER SYSTEMS-III**

(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Discuss why
The function $f(x \pm vt)$ represents is a traveling wave.
(b) A traveling wave suffers reflection when it reaches a discontinuity. [8+8]
2. (a) Calculate the ohmic value of impedance to be connected in the neutral to ground circuit of 2000KVA transformer with earth fault relay set to 40% with respect to 4000V side .
(b) In a 50 cycles/sec overhead line the capacitance of one line to earth was 1.5μ f It was decided to use an earth fault neutralizer . Calculate the reactance neutralize the capacitance of
 - i. 100% of the length of line
 - ii. 75% of the length of line [8+4+4]
3. (a) Why is current chopping not a serious problem with vacuum circuit breakers.
(b) How does SF6 breakers differ from an air blast circuit breakers
(c) What are the possible applications of vacuum circuit breakers [6+6+4]
4. Write short notes on the following. [4x4=16]
 - (a) Making capacity
 - (b) Short time current rating
 - (c) Rated voltage, current and frequency
 - (d) Rated operating duty
5. (a) Explain in detail the role of protective relays in a power systems.
(b) Discuss in detail the causes and types and frequency of faults encountered in a power system. [8+8]
6. (a) Explain the merits and demerits of static relays.
(b) Discuss how an amplitude comparator can be converted into a phase comparator and vice versa. [8+8]
7. (a) Discuss the protection employed against the loss of excitation of an alternator.
(b) Is there any back up protection employed for the protection of an alternator. If yes, discuss the scheme, which is used for this purpose. [8+4+4]

8. (a) Discuss the time graded over current protection for
- i. Radial feeders
 - ii. Ring main system. [4+4]
- (b) Explain the carrier system of protection. with a block diagram and neat sketches discuss how the phase comparison scheme can be used for protecting a feeder. [4+4]

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1. Develops equivalent circuit for analyzing the behavior of traveling waves at transition points on transmission lines. [16]
2. Discuss the advantages of the neutral grounding and explain why there is a trend at present towards effectively earthed systems ? [10+6]
3. (a) Explain how sf_6 gas is ideally suitable for circuit breaker.
(b) Explain the operation of SF6 circuit breaker with relevant sketch in a detailed manner. [8+6+2]
4. Explain direct testing of circuit breakers with a neat diagram [8+8]
5. (a) What is meant by directional feature of a directional over current relay? Describe the construction, principle of operation and application of a directional over current relay. [2+2+2+2]
(b) What is the difference between a polarized mho and simple mho relay. What are self-polarized and cross-polarized mho relays? [4+4]
6. (a) Explain with necessary diagrams the operating principle a Rectifier bridge phase comparator. [6+2]
(b) Why are block average phase comparator preferred over block spike phase comparator. [4+4]
7. What are the types of faults that are likely to occur in an alternator? Explain a protection scheme against any one of these faults. [8+8]
8. (a) Describe the method of protecting busbars by differential relaying.
(b) What are the limitations of this method and to what extent these can be overcome? [8+8]

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1. (a) A three-phase single circuit transmission line is 400 kilometre long. If the line rated for 400kv and has line constants $R=0.1\Omega /km$, $L=1.26mH/km$, $C=0.009\mu F/km$ and $G=0$. Calculate the following.
 - i. Surge impedance
 - ii. Velocity of surges neglecting R of line.
 - iii. If a rectangular surge of 500kv is incident at one end, find the time to reach the open end.
 - iv. The voltage at the open end of line. [4+4+2+2](b) Explain about attenuation and distortion. [4]
2. Describe the construction and working principle of a zinc oxide gapless arrester with a neat sketch . [8+8]
3. Explain the following with relevant diagrams.
 - (a) Open fuse
 - (b) Semi enclosed rewirable fuse [4+4+4+4]
4. (a) Explain the Phenomenon of current chopping in a circuit breaker. What measures are taken to reduce it. [4+4]
 - (b) A circuit interrupts the magnetizing current of a 100MVA transformer at 220kV. The magnetizing current is 5% of the full load current. Determine the maximum voltage which may appear across the Gap of the breaker when the magnetizing current is interrupted at 53% of its peak value. The stray capacitance is 2500 microfarad. The inductance is 30H. [8]
5. (a) What is meant by directional feature of a directional over current relay? Describe the construction, principle of operation and application of a directional over current relay. [2+2+2+2]
 - (b) What is the difference between a polarized mho and simple mho relay. What are self-polarized and cross-polarized mho relays? [4+4]
6. (a) Explain the merits and demerits of static relays.
 - (b) Discuss how an amplitude comparator can be converted into a phase comparator and vice versa. [8+8]
7. (a) Discuss the protection employed against loss of excitation of alternator.

- (b) Discuss any one of the stator protection schemes for generators above 1MW.
[8+8]
8. Explain the principle of distance relaying applied to protection of radial transmission lines. Distinguish between reactance, impedance and mho relays as regards their applications to distance protection.
[8+4+4]

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1. (a) A rectangular surge of 1000kv incident on a over head transmission line of surge impedance of 300Ω ,meets a junction of two cables of surge impedance 150Ω and 100Ω .calculate the outgoing voltages and currents on each cable and also the over head line. Derive the formula used.
(b) Explain briefly about equivalent circuit for traveling wave studies. [4+4+8]
2. (a) Explain the statement in ungrounded system “ Healthy line voltage increases by $\sqrt{3}$ times during an earth fault on the third line ”.
(b) Discuss the merits of
 - i. Solid grounding
 - ii. Resistance grounding. [8+4+4]
3. Explain the following with relevant diagrams.
 - (a) Open fuse
 - (b) Semi enclosed rewirable fuse [4+4+4+4]
4. Explain resistance switching in detail with relevant diagrams and derive the expression of damped oscillation. [4+8+4]
5. (a) What is meant by directional feature of a directional over current relay? Describe the construction, principle of operation and application of a directional over current relay. [2+2+2+2]
(b) What is the difference between a polarized mho and simple mho relay. What are self-polarized and cross-polarized mho relays? [4+4]
6. (a) Explain the merits and demerits of static relays.
(b) Discuss how an amplitude comparator can be converted into a phase comparator and vice versa. [8+8]
7. With the help of neat sketches explain the protections of a star – delta power transformer,against the following abnormal conditions
 - (a) phase to phase fault
 - (b) earth fault
 - (c) high voltage surges [6+6+4]

8. (a) Explain how the selection of current and time settings is done in a time current graded system. [8]
- (b) Give schemes of protection for a parallel feeder fed from
- i. one end
 - ii. both the ends. [4+4]

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