

# CBCS SCHEME

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15EE72

## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Power System Protection

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. With schematic diagram, explain various zones of protection of a power system. (06 Marks)
- b. Explain the importance of automatic reclosing. (04 Marks)
- c. What are the advantages of static relays over electro mechanical relays? (06 Marks)

OR

- 2 a. The current rating of a relay is 5Amps, PSM = 1.5 CT ratio is 400/5. Fault current = 6000 Amps. Determine the operating time of the relay for a TMS = 0.4. The operating time at various PSM at TMS = 1 are given in the below table. (06 Marks)

PSM	2	4	5	8	10	20
Operating time in seconds	10	5	4	3	2.8	2.4

- b. Draw the schematic diagram of numerical relay and explain the functions of various components. (06 Marks)
- c. With neat sketch, explain the working principle of reed relay. (04 Marks)

### Module-2

- 3 a. Explain different types of over current protective schemes. (08 Marks)
- b. Explain impedance relay characteristics in the R-X diagram. (04 Marks)
- c. What are the advantages of numerical over current relays over conventional over current relays? (04 Marks)

OR

- 4 a. Explain stepped time-distance characteristics of three distance relaying units used for I, II and III zone of protection. (06 Marks)
- b. Explain how reactance relay and MGO relay characteristics are realized using a sampling comparator. (06 Marks)
- c. With neat diagram, explain an over current protective scheme for a ring feeder. (04 Marks)

### Module-3

- 5 a. What are the important operating principles which are used in wire 'pilot' schemes? With schematic diagram, explain circulating current principle. (06 Marks)
- b. Explain the working principle of 'Buchholz' relay used for the protection of transformer. (05 Marks)
- c. With schematic diagram, explain balanced (opposed) voltage differential protection. (05 Marks)

OR

- 6 a. With neat sketch, explain frame leakage protection scheme. (04 Marks)  
b. With schematic diagram, explain protection of stator against over heating in an alternator. (06 Marks)  
c. What is simple differential protection scheme? Explain its behavior during normal condition. (06 Marks)

**Module-4**

- 7 a. With neat sketches, explain the recovery rate theory of arc interruption in a circuit breaker. (06 Marks)  
b. What are the advantages and disadvantages of SF<sub>6</sub> circuit breaker? (06 Marks)  
c. Explain the phenomenon of current chopping in a circuit breaker. (04 Marks)

OR

- 8 a. With neat circuit diagram explain synthetic testing of a circuit breaker. (06 Marks)  
b. With neat sketch, explain the working principle of axial blast circuit breaker. (05 Marks)  
c. With schematic diagram, explain the working of 'HVDC' circuit breaker. (05 Marks)

**Module-5**

- 9 a. With neat diagrams, explain the phenomenon of lighting. (06 Marks)  
b. Describe the construction and working of the HRC cartridge fuse. (05 Marks)  
c. With neat sketch, explain the construction and working of 'Klydonograph'. (05 Marks)

OR

- 10 a. What are the various components of GIS? Briefly describe their functions. (07 Marks)  
b. With neat diagram, explain the working of expulsion type lighting arrester. (05 Marks)  
c. What is insulation coordination? Explain its volt time curve. (04 Marks)

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# CBCS SCHEME

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15EE73

## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 High Voltage Engineering

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Derive an expression for the current in the air gap that is  $i = i_0 e^{\alpha d}$  considering Townsend first ionization coefficient. (07 Marks)
- b. What are the limitation of Townsend's theory? (03 Marks)
- c. In an experiment in a certain gas it was found that the steady state current is  $5.5 \times 10^{-8}$  A at 8kV at a distance of 0.4cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1cm results in a current of  $5.5 \times 10^{-9}$  A. Calculate Townsend's primary ionization coefficient  $\alpha$ . (06 Marks)

OR

- 2 a. Explain briefly suspended particle theory of breakdown in liquid dielectric. (06 Marks)
- b. Explain the following breakdown mechanism in solid:  
i) Electro mechanical breakdown  
ii) Thermal breakdown. (10 Marks)

### Module-2

- 3 a. With the help of a neat sketch, explain how cascade transformer generates High Voltage AC. (06 Marks)
- b. What is Tesla coil? How are damped high frequency oscillation obtained from the Tesla coil? (06 Marks)
- c. A Cockcroft-Walton type voltage multiplier has eight stages with capacitances, all equal to  $0.05\mu\text{F}$ . The supply transformer secondary voltage is 125kV at a frequency of 150Hz. If the load current to be supplied is 5mA, find i) The percentage ripple ii) the regulation. (04 Marks)

OR

- 4 a. With neat sketch, explain the Mark's circuit arrangement for multistage impulse generator. (07 Marks)
- b. With a neat diagram, explain the operation of trigatron gap. (06 Marks)
- c. Define wave front and wave tail times of an impulse voltage wave. (03 Marks)

### Module-3

- 5 a. With neat sketch, explain principle, working and construction of electrostatic voltmeter. (06 Marks)
- b. Briefly explain the factors affecting measurement of voltage using sphere gap. (05 Marks)
- c. Explain the working principle of generating voltmeter with a neat sketch. (05 Marks)

OR

- 6 a. Explain the Chubb-Fortscue method for measurement of peak value of an ac voltage waveform. (06 Marks)
- b. With the help of a neat sketch, explain the working of Rogowski coil for high impulse current measurement. (06 Marks)
- c. A generating voltmeter has to be designed so that it can have a range from 20 to 200kV dc. If the indicating meter reads a minimum current of  $2\mu\text{A}$  and maximum current of  $25\mu\text{A}$ , what should the capacitance of generating voltmeter be? (04 Marks)

**Module-4**

- 7 a. Explain the different theories of charge formation in clouds. (08 Marks)
- b. Explain with suitable figures the principles and functioning of  
i) Expulsion gaps      ii) Protector tubes. (08 Marks)

OR

- 8 a. What is a surge arrester? Explain its function as a shunt protective device. (08 Marks)
- b. Write short notes on:  
i) Rod gaps used as protective devices. (08 Marks)
- ii) Ground wires for protection of overhead lines. (08 Marks)

**Module-5**

- 9 a. Discuss the method of discharge detection using straight detector. (08 Marks)
- b. Explain the method of measuring dielectric loss at power frequency using high voltage Schering bridge. (08 Marks)

OR

- 10 a. Describe the various electrical tests done on transformers. (08 Marks)
- b. Write a different methods of conducting a short circuit tests on circuit breakers. (08 Marks)

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# CBCS SCHEME

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15EE742

## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Utilization of Electrical Power

Time: 3 hrs.

Max. Marks: 80

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. With a neat sketch, explain the construction, working principle of Ajax Wyatt furnace. (06 Marks)
- b. Explain with a neat sketch, how the spot welding is carried out by a Spot welding machine. (04 Marks)
- c. A 45 KW, 3 phase, 415V resistance oven employs a nichrome strip of thickness 0.25mm for a 3-phase star connected heating elements. If the wire temperature is to be 1200°C and that of the charge to be 800°C, estimate the length and width of the strip. Assume radiating efficiency of 0.57 and emissivity of 0.9. The specific resistance of nichrome is  $1.03 \times 10^{-6} \Omega - m$ . (06 Marks)

OR

- 2 a. State Faraday's laws of Electrolysis and explain:  
i) Current efficiency ii) Energy efficiency. (06 Marks)
- b. How much aluminum will be produced from aluminum oxide in 24 hrs if the average current is 3,500A and the current efficiency is 90 percent? Aluminum is Trivalent and its atomic weight is 27. The chemical equivalent of silver is 107.98 and 0.00111gm of silver is deposited by one Coulomb. (04 Marks)
- c. A circular shaft of a diameter 12cm and 24cm long is to be coated with a layer of 1.6mm nickel. The current density is 200 A/m<sup>2</sup> and current efficiency is 95%. The specific gravity of nickel is 8.9 and its E.C.E is 1.0954 kg per 1,000 Ah. Determine the quantity of electricity required in Ah and time taken for the process in hours. (06 Marks)

### Module-2

- 3 a. Two lamp posts are 20m apart and are fitted with lamps of luminous intensity 200 C.P. each at a height of 6m above the ground. Calculate the illumination on the ground i) under each lamp ii) midway between the lamps. (06 Marks)
- b. Define i) Luminous Flux ii) Luminous intensity iii) Illumination iv) Brightness v) Reduction factor vi) Coefficient of utilization. (06 Marks)
- c. Explain the working of fluorescent lamp with neat circuit diagram. (04 Marks)

OR

- 4 a. A workshop measuring 30 × 12m is to be provided with an illumination of 100 Lux on the working plane. The coefficient of utilization is 0.4 and the maintenance factor is 0.8 and the luminous efficiency of the lamps is 14 lumens per Watt. Calculate the number of lamps required and their deposition. (06 Marks)
- b. With a neat figure, explain the construction and working principle of sodium vapour discharge lamp. (05 Marks)
- c. i) What are the general requirements of factory lighting?  
ii) What is flood lighting? (05 Marks)

**Module-3**

- 5 a. Derive an expression for the specific energy output. (06 Marks)  
 b. An electric train is accelerated from rest to a speed of 60 kmph in 30 seconds. The power is cut off and then the train coasts for 75 seconds against a constant resistance of 50 N/tonne and then braked to rest at 4 kmphs in 15 seconds. Calculate the schedule speed, if the duration of station stops is 30 seconds. Allow 10% for rotational inertia. If the stations stop is reduced to 10 seconds, what is the new schedule speed? (06 Marks)  
 c. What are the advantage and disadvantages of Electric Traction? (04 Marks)

**OR**

- 6 a. Derive an expression for the tractive effort in terms of the weight of the train, acceleration, gradient and train resistance. (06 Marks)  
 b. Define Specific Energy consumption and explain the various factors on which it depends. (06 Marks)  
 c. Explain with the help of suitable circuit diagrams :  
 i) Shunt transition ii) Bridge transition as applied to a pair of d.c. traction motors. (04 Marks)

**Module-4**

- 7 a. Describe how plugging, rheostatic braking and regenerative braking are employed with d.c motors. (06 Marks)  
 b. Discuss Mechanical braking arrangements used in electric traction. (04 Marks)  
 c. A 525 – V series traction motor has the following characteristics :

Current (A)	50	70	80	90
Speed (Kmph)	33.8	26.9	25.1	23.8
Torque (N – m)	216	344	422	500

What will be the braking torque at a speed of 26 kmph when operating as a self – excited series generator, the resistance of the braking rheostat being 5.5 ohms and that of the motor being  $0.5\Omega$ ? (06 Marks)

**OR**

- 8 a. Show how sag and tension are calculated in trolley wires. (06 Marks)  
 b. Explain the function of a negative booster in a tramway system. (06 Marks)  
 c. Sketch and explain the following arrangements of current collection used in electric traction:  
 i) Trolley – wire section ii) The bow collector iii) Current collecting shoe  
 iv) Collector wheel and Trolley - wire. (04 Marks)

**Module-5**

- 9 a. Explain with neat diagram the concept of series Hybrid Electric Drive trains. (06 Marks)  
 b. Explain General Electric vehicle configuration with block diagram. (06 Marks)  
 c. Explain Traction Motor characteristics of Electric vehicles. (04 Marks)

**OR**

- 10 a. Explain the concept of energy consumption of Electric vehicles using suitable equations. (06 Marks)  
 b. Explain the concept of Hybrid Electric drive trains. (04 Marks)  
 c. Explain with a neat diagram, the concept of Speed – Coupling Parallel Hybrid Electric Drive trains. (06 Marks)

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15EE752

## Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 Testing and Commissioning of Power System Apparatus

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Explain the method of Artificial Respiration. (08 Marks)  
b. Explain briefly special tools for live line maintenance. (08 Marks)

OR

- 2 a. What are the points to be considered in location and site selection for transformer installation? (08 Marks)  
b. Explain Drying of Transformer. (08 Marks)

### Module-2

- 3 a. Mention the specifications of synchronous machines. (06 Marks)  
b. Explain briefly Testing of synchronous machines. (10 Marks)

OR

- 4 a. Explain about the sudden 3 phase short circuit test on generator. (08 Marks)  
b. Explain cooling operation of synchronous machines. (08 Marks)

### Module-3

- 5 a. Mention the specification of induction motor. (08 Marks)  
b. Explain the concept of Installation of induction motor. (08 Marks)

OR

- 6 a. Write a short note on drying of winding induction motor. (10 Marks)  
b. Explain the temperature rise test on induction motor. (06 Marks)

### Module-4

- 7 a. Explain the various aspects to be considered in laying underground cables. (08 Marks)  
b. Explain how to check cable fault by means of a megger. (08 Marks)

OR

- 8 a. List the various test conducted on power cables at works and at site. (08 Marks)  
b. What precautions are necessary in cable jointing? (08 Marks)

### Module-5

- 9 a. Mention the steps involved in installation of outdoor circuit breakers (08 Marks)  
b. Briefly explain commissioning tests on circuit breakers. (08 Marks)

OR

- 10 a. Briefly explain the maintenance of circuit breakers. (08 Marks)  
b. Explain protective devices Residential electrical Installation. (08 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.