F 4519 (Pages : 2) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

## Eighth Semester

Branch—Electrical and Electronics Engineering

EE 010 801—POWER SYSTEM ANALYSIS (EE)

(New Scheme—2010 Admission Onwards)

[Supplementary]

Time : Three Hours Maximum : 100 Marks

## Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. What are the types of buses considered for load flow analysis ?
2. Define economic load dispatch.
3. What is area control error ?
4. What do you mean by sequence networks ?
5. Define stability.

(5 × 3 = 15 marks)

## Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. Show that per unit reactance of transformer is same on either side of LV or HV side.
7. Write a note on economic loading of generators.
8. Explain two area load frequency control.
9. What are symmetrical components ? What are their uses in power systems ?
10. From the fundamentals, derive the inertia constant of synchronous machine.

(5 × 5 = 25 marks)

## Part C

*Answer* **all** *questions.*
*Each full question carries* 12 *marks.*

11. A 120 MVA, 19.5 kV generator has a synchronous reactance of 0.15 p.u and it is connected to a transmission line through a transformer rated 150 MVA, 230/18 kV (Y/Δ) with X = 0.1 p.u.

    (a) Calculate the p.u. reactances by taking generator rating as base values.

    (b) Calculate the p.u. reactance by taking transformer rating as base values.

    (c) Calculate the p.u. reactances for a base value of 100 MVA and 220 kV on HT side of transformer.

*Or*

**Turn over**

12. Write a technical note on :

    (a) One line diagram ;

    (b) Impedance diagram ;

    (c) Reactance diagram.

    for a sample power system selected.

13. With block schematic explain automatic load dispatch in power systems.

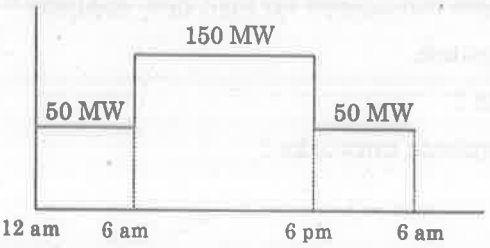
*Or*

14. Assume that the fuel input in Btu/hr for 1 and 2 are given by :

    $F1 = (8\ P1 + 0.024\ P1^2 + 80)10^6$

    $F2 = (6\ P2 + 0.04\ P2^2 + 120)10^6$

    The maximum and minimum loads on the units are 100 MW and 10 MW. Determine minimum cost of generation when the following load is supplied. The cost of fuel is Rs. 2 per million Btu.




15. Explain in detail, the turbine speed governing system.

*Or*

16. With the help of a block schematic, explain the automatic voltage regulator of a generator.

17. Describe Z bus building algorithm and fault analysis using Z bus.

*Or*

18. (a) A 3-phase, 37.5 MVA, 33 kV alternator having $X_1 = 0.18$ p.u, $X_2 = 0.12$ p.u and $X_0 = 0.10$ p.u, based on its rating, is connected to a 33 kV overhead line having $X_1 = 6.3$ ohms, $X_2 = 6.3$ ohms and $X_0 = 12.6$ ohms per phase. A single line to ground fault occurs at the remote end of the line. The alternator neutral is solidly grounded. Calculate the fault current. (8 marks)

    (b) Describe sequence impedances and networks of transmission line. (4 marks)

19. (a) Explain transient and steady state stability. (7 marks)

    (b) Discuss the methods to improve transient stability. (5 marks)

*Or*

20. A generator operating at 50Hz delivers 1.0 p.u. power to an infinite bus through a transmission circuit in which resistance is ignored. A fault takes place reducing the maximum power transferable to 0.5 p.u. whereas before the fault this power was 2.0 p.u. and after the clearance of the fault it is 1.5 p.u. By the use of equal area criterion determine the critical clearing angle.

[5 × 12 = 60 marks]

F 4529 (Pages : 2) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

## Eighth Semester

Branch—Electrical and Electronics Engineering

EE 010 802—SWITCH GEAR AND PROTECTION (EE)

(New Scheme—2010 Admission onwards)

[Supplementary]

Time : Three Hours Maximum : 100 Marks

### Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. What are the merits and demerits of circuit breaker ?
2. Explain the impedance relay.
3. What are the different characteristics of mhos relays ?
4. Explain different types of protection of feeders.
5. Enumerate the causes of over voltage.

(5 × 3 = 15 marks)

### Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. Explain the basics of switch gear and earthing switches.
7. Explain in detail about distance relay and its operating principle.
8. What are the applications of microprocessor based relay system ?
9. What are the faults involved in Transformer ?
10. Discuss in detail about surge arrestors.

(5 × 5 = 25 marks)

### Part C

*Answer any* **one** *question from each module.*
*Each question carries* 12 *marks.*

11. Describe the construction, operation and types of oil circuit breaker.

*Or*

12. Describe in detail about SF6 gas circuit breaker.

**Turn over**

13. Describe with neat diagram construction and working of induction.

*Or*

14. Discuss in detail about over current relay and its types.

15. What is meant by static relay and explain the various components involved in static relay system ?

*Or*

16. Describe the construction and working principle of micro process based over current, impedances and reactance relay.

17. Discuss translay scheme for feeder protection.

*Or*

18. Give detailed description about various methods of motor protection schemes.

19. Describe in detail about power frequency and switching over voltage involved in power system.

*Or*

20. Describe various types of lighting arrestors for protection against surge voltage.

(5 × 12 = 60 marks)

F 4569 (M)

(Pages : 2) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

## Eighth Semester

Branch : Electrical and Electronics Engineering

EE 010–80 4L 06—OPTO ELECTRONICS (Elective-III) [EE]

[New Scheme—2010 Admission onwards–Supplementary]

Time : Three Hours Maximum : 100 Marks

## Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. Define electromagnetic mode theory.
2. What is meant by injection efficiency ?
3. Explain APD Bandwidth.
4. Explain speckle noise.
5. What is meant by displacement sensor ?

(5 × 3 = 15 marks)

## Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. Explain linear and non-linear scattering loss.
7. List and explain the major advantages of LED over LCD.
8. Explain the characteristic of p-i-n photodiode with energy band diagram.
9. Explain noise penalty in a practical system.
10. Write a short note on fibre optic sensors and its applications.

(5 × 5 = 25 marks)

## Part C

*Answer* **all** *questions.*
*Each question carries* 12 *marks.*

11. Explain attenuation in OFC. Discuss all the factors with necessary equations and diagrams.

*Or*

12. Write a note on :
    (i) Dispersion Mechanisms.
    (ii) Step Index and Graded Index.

**Turn over**

13. Write a short note on :
    (i) Diffusion Coefficient and Diffusion Length.
    (ii) Spontaneous and Stimulated emission.

*Or*

14. Explain the operation of LED. Derive an expression for its frequency response and bandwidth.

15. Discuss the different types of noises in the photodiodes.

*Or*

16. Write a short note on :
    (i) Rise time budget.
    (ii) Link Design.
    (iii) Quantum Efficiency.

17. Write a note on :
    (i) Fiber optic receivers.
    (ii) Reflection Noise.
    (iii) Equalization and Sensitivity.

*Or*

18. Explain in detail about eye diagram. What is its use ? How can it be used for link design ?

19. Write a short note on:
    (i) WDM.
    (ii) Erbium doped optical Amplifier.
    (iii) Strain and temperature sensors.

*Or*

20. Write a short note on :
    (i) Raman Amplifier.
    (ii) Optical logic gates.
    (iii) Displacement Sensor.

(5 × 12 = 60 marks)

17. Derive an expression for fault current due to a double Line to ground fault on an unloaded alternator. Also draw the sequence network.

(12 mark)

*Or*

18. A 1250 kVA, 5000 V generator with $X''_d = 0.08$ p.u. supplies a purely resistive load of 1000 kW at rated voltage. The load is connected directly across the terminals of the generator. If all the three phases of the load are short circuited simultaneously find the initial symmetrical short circuit current in the generator.

(12 mark)

19. Explain the critical clear angle and critical clearing time. Also derive an expression for both.

(12 mark)

*Or*

20. Explain the modified Euler's method for analyzing power system stability. (12 mark)

[5 × 12 = 60 marks]

**F 4323** 3 **(Pages : 4)** **Reg. No.....**

**Name.....**

# B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

**Eighth Semester**

Branch : Electrical and Electronics Engineering

POWER SYSTEM ANALYSIS (E)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

## Part A

*Answer* **all** *questions.*

*Each question carries* 4 *marks.*

1. What is the per unit system ? Explain its advantages.
2. What are symmetrical components ? Explain its application in power system.
3. Compare the G-S and N-R methods of load flow solutions.
4. With help of a suitable example briefly explain the direct formation of Y-bus.
5. What is economic load dispatch ? Explain its importance in power system.
6. Explain the transmission losses that are accommodated in economic load dispatch problems.
7. How will you determine the synchronous, transient and subtransient reactance from the oscillogram of the short circuit current.
8. What are the main factors to be considered to select a circuit breaker ?
9. Clearly distinguish between transient stability and dynamic stability.
10. Briefly explain the methods to improve transient stability.

(10 × 4 = 40 marks)

## Part B

*Answer* **all** *questions.*

*Each question carries* 12 *marks.*

11. Find the bus impedance matrix for the system whose reactance diagram is given in (Fig. 1 on 2nd page) all the impedances in PU

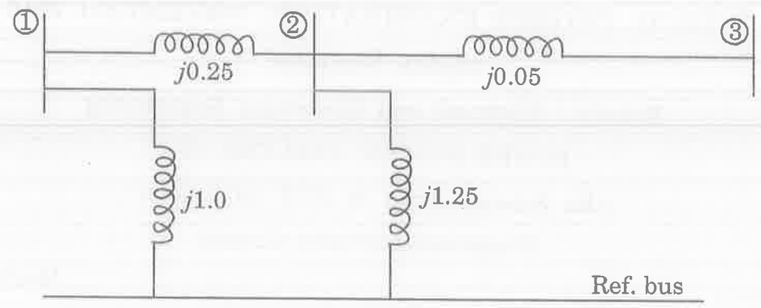



**Fig. 1**

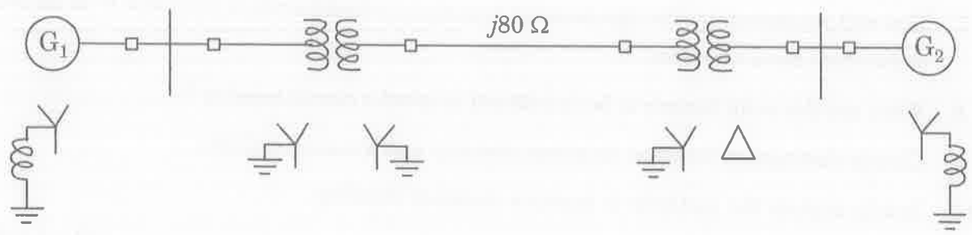
*Or*

12. (a) Draw and explain the sequence network of an unloaded alternator. (4 marks)

(b) Draw the reactance diagram for the power system shown in Fig. 2. Neglect the resistance and use a base of 50 MVA, 110 kV in 80 Ω transmission line. The rating of generators and transformers are given below.

Generator 1: 50 MVA, 13.8 kV, $X''$ = 15 % ; Generator 2 : 40 MVA, 33 kV, $X''$ = 20%;

Y–Y Transformer : 60 MVA, 16/ 110 kV, X = 10 % ; Y-Δ Transformer : 40 MVA, 33/110 kV, X = 15 %




(8 marks)

**Fig. 2**



13. For the network given in Fig. 3, obtain the complex bus voltage at the end of first iteration using GS method. Bus 1 is a slack bus with $V_1 = 1.0 \angle 0°$. Take $P_2 + j\,Q_2 = -5.96 + j\,1.46$, $P_3 = 6.02$ and $V_3 = 1.02$. Assume $V_3° = 1.02 \angle 0°$ and $V_2° = 1 \angle 0°$.

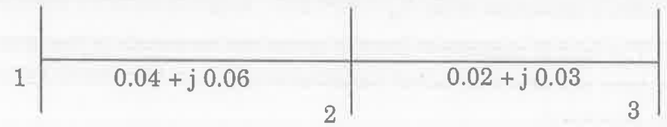



**Fig. 3** (Line Impedances are in p.u.)

(12 mark)

*Or*

14. With neat flow- chart explain clearly Newton - Raphson method for solving the load flow equations of a power system with PV buses.

(12 mark)

15. (a) Explain the following terms related with a thermal power station (i) Heat rate ; (ii) Incremental production cost ; and (iii) Incremental efficiency.

(6 mark)

(b) What are the power system constraints related with economic load dispatch ? Explain.

(6 mark)

*Or*

16. A two bus system is shown in Fig. 4. If a load of 125 MW is transmitted from plant 1 to load, a loss of 15.625 MW is incurred. Determine the generation schedule and the load demand if the cost of received power is Rs. 24/MWhr. Solve the problem using co-ordination equations.

The incremental production costs of the plants are

$dF_1 / dP_1 = 0.025\ P_1 + 15$ ; $dF_2 / dP_2 = 0.05\ P_2 + 20$


**Fig. 4**

(12 mark)