



CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech V Semester Supplementary Examinations December-2024

Course Name: Power Systems-II

(Electrical & Electronics Engineering)

Date: 16.12.2024 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks.

10x2=20M

- | | | |
|-----|---|-----|
| 1. | What is the full forms for GMD? | 2 M |
| 2. | What are bundled conductors and mention its advantages? | 2 M |
| 3. | Write A, B, C and D constants of a short transmission line. | 2 M |
| 4. | Classify the transmission lines based on the voltage. | 2 M |
| 5. | Define Ferranti effect. | 2 M |
| 6. | Define corona of power system. | 2 M |
| 7. | Give applications of sag template. | 2 M |
| 8. | Define stringing chart. | 2 M |
| 9. | State the properties of insulating materials used for cables. | 2 M |
| 10. | What are the different types of cables? | 2 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | | |
|-----------|---|----|
| 11.A). | i) Derive the expression for inductance of three phase transmission line with symmetrical spacing. | 5M |
| | ii) In a 3 phase transmission line the 3 conductors are placed at the corners of a triangle of sides 2m, 3m and 2.5m. If the diameter of each conductor is 1.6cm and conductors are regularly transposed, calculate the inductance per phase per kilometer. | 5M |
| OR | | |
| 11. B). | i) Derive the capacitance of 3 phase symmetrical transmission line. | 5M |
| | ii) Discuss the effect of Ground on capacitance of transmission lines. | 5M |
| 12. A). | i) Derive the A, B, C and D constants for Nominal-T model | 5M |
| | ii) A single phase over head transmission line is delivering 600kVA load at 2kV.It's resistance and reactance are 0.18ohm and 0.36ohm per phase. Determine the voltage regulation if the load power factor is i) 0.8 P.F lag ii) 0.8 P.F lead. | 5M |
| OR | | |
| 12. B). | i) What is surge impedance and surge impedance loading of a transmission line? What is the physical significance of SIL? | 5M |
| | ii) What is an equivalent pie circuit model of long line? Derive expression for parameters of this circuit in terms of line parameters. | 5M |

(P.T.O..)

13. A). i) Show that surges behave as travelling waves. Derive expressions for surge impedance and wave velocity. 5M
ii) An overhead transmission line with surge impedance 400 ohms is 300 km long. One end of this line is short circuited and at the other end a source of 11 kV is suddenly switched in. Calculate the current at the source end 0.005 sec after the voltage is applied. 5M

OR

13. B). i) Explain, how does skin and proximity effects on resistance of solid conductor. 5M
ii) A 132 kV line with 1.956 cm dia. conductors is built so that corona takes place if the line voltage exceeds 210 kV (r.m.s.). If the value of potential gradient at which ionization occurs can be taken as 30 kV per cm, find the spacing between the conductors. 5M
14. A). i) Explain about the various methods to improve the string efficiency. 5M
ii) With neat sketch explain about suspension type and strain type insulators. 5M

OR

14. B). i) Derive the sag expression for a transmission line with the effect of ice covering and wind pressure. 5M
ii) A transmission line has a span of 150m between level supports. The line conductor has a cross-sectional area of 1.25cm^2 and it weighs 120kg per 100 m. If the breaking stress of copper conductor is 4220 kg per cm^2 . Calculate the maximum sag for a safety factor of 4. Assume maximum wind pressure of 90 kg per m^2 . 5M
15. A). i) With neat sketch explain about construction of underground cable. 5M
ii) The inner and outer diameter of a cable are 3.5cm and 9 cm respectively. The cable is insulated with two materials having permittivities of 6 and 4 respectively with corresponding stresses of 40 kV/cm and 30 kV/cm. Calculate the radial thickness of each insulator layer and safe working voltage of the cable. 5M

OR

15. B). Explain about different methods of grading of cables. 10M



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech V Semester Supplementary Examinations December-2024

Course Name: Control Systems

(Electrical & Electronics Engineering)

Date: 18.12.2024 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks.

10x2=20M

1. Examine how the summing point and take off point are interchanged. 2 M
2. Compare Signal Flow Graph approach with block diagram reduction technique of determining transfer function. 2 M
3. The damping ratio of the system is 0.6 and the natural frequency of oscillation is 8 rad/sec. Estimate the peak over shoot of the system. 2 M
4. Infer the relation between static and dynamic error coefficients. 2 M
5. Define gain margin and phase margin. 2 M
6. What is breakaway point and breakin point? 2 M
7. Why are compensators required in feedback control system? What is compensation? 2 M
8. State Nyquist stability criterion. 2 M
9. Examine the condition for a system is completely state controllable? 2 M
10. What are the limitations of physical system modelled by transfer function approach. 2 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). i) Develop the transfer function for the block diagram shown in fig.1 using Block diagram reduction technique. 5M

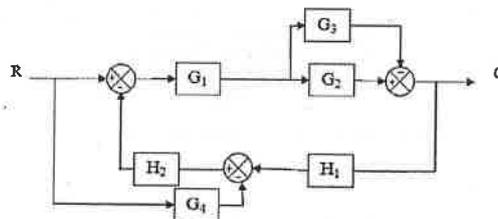


Fig.1

- ii) Write the differential equations governing the mechanical system shown in fig.2 5M

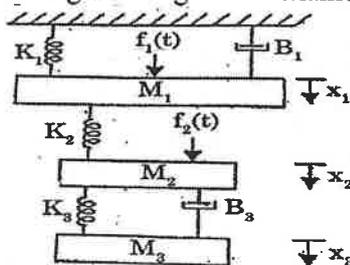


Fig.2

(P.T.O..)

OR

11. B). Analyze the given signal flow graph and obtain the transfer function

10M

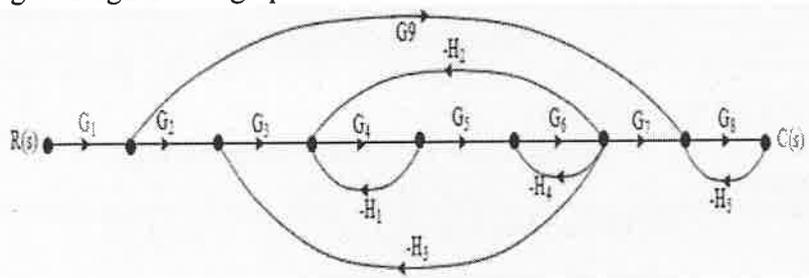


Fig.3

12. A). Derive the step response of second order system for under damped condition.

10M

OR

12. B). i) A unity feedback system has an open loop transfer function $G(s) = \frac{10}{s(s+2)}$. Find rise time, percentage overshoot, peak time and settling time for step input of 12 units. 7M
- ii) For servo mechanism with open loop transfer function given below explain which type of input signal give rise to a constant steady state error and calculate their values. 3M

$$G(s) = \frac{10}{s^2(s+1)(s+2)}$$

13. A). Sketch the root locus for the following system and find the breakaway and break-in points

10M

$$G(s) = \frac{K(s-3)(s-5)}{(s+1)(s+2)}$$

OR

13. B). Draw the bode asymptotic magnitude plot for a unity feedback system whose open loop transfer function given.

10M

$$G(s) = \frac{10}{s(s+1)(0.1s+1)}$$

14. A). Sketch the polar plot for the following transfer function and evaluate Gain cross over frequency, Phase cross over frequency, Gain margin and Phase margin for the system.

10M

$$G(s) = \frac{400}{s(s+2)(s+10)}$$

OR

14. B). Design a suitable lead compensator for a system with unity feedback and having open loop transfer function

10M

$$G(s) = \frac{K}{s(s+1)(s+4)}$$

to meet the specifications as damping ratio = 0.5 and undamped natural frequency = 2 rad/sec.

15. A). Consider a control system with state model

10M

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} u$$

Where u = unit step input, compute the state transition matrix

OR

15. B). Solve the following differential equation by converting it into state variable form:

10M

$$\frac{d^2y}{dt^2} + \frac{dy}{dx} - 2y = u(t)e^{-t}$$

Where $y(0) = 0; \dot{y}(0) = u(t) = \text{unit step input}$

H.T No:

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R18

Course Code: A30212



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech V Semester Supplementary Examinations December-2024

Course Name: Power System Protection

(Electrical & Electronics Engineering)

Date: 20.12.2024 AN

Time: 3 hours

Max.Marks:70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks. 10x2=20M

1. Define circuit breaker & mention the types of circuit breakers. 2 M
2. Define restriking voltage & write the formula for restriking voltage. 2 M
3. Define pickup value and PSM of the relay. 2 M
4. Mention the applications of Distance relays. 2 M
5. For protecting the feeders.....relays are used at source side &.....relays used at load side. 2 M
6. Mention the type of faults occur in a transformer? & which protection scheme can be used to protect the external faults in a transformer. 2 M
7. Define the arching ground and What are the factors causing arching grounds. 2 M
8. What is meant Peterson coil grounding and write the formula for inductance of peterson coil? 2 M
9. Define the BIL & impulse ratio. 2 M
10. Define the voltage surge & lightning. 2 M

PART-B

Answer the following.Each question carries TEN Marks. 5x10=50M

- 11.A). Explain the construction, principle of operation and applications of air blast circuit breaker with neat sketch. 10M
- OR**
11. B). i) Explain about current chopping in a circuit breakers. 5M
ii) Derive the expression for restriking voltage across the circuit breakers. 5M
12. A). Explain the construction of induction type of relays with neat sketch. 10M
- OR**
12. B). Explain about the types of Distance relays with required equations and also draw their characteristics. 10M
13. A). Explain about the protection of transformers by using the differential protection with neat sketch? And also mention the limitations. 10M
- OR**
13. B). i) Explain about the protection of inter-turn faults in an alternator. 5M
ii) Discuss about the protection of feeders by using time graded overcurrent protection. 5M
14. A). i) Discuss about the ungrounded system. 5M
ii) What are the merits of neutral grounding system? 5M
- OR**
14. B). Explain about the types of grounding methods with required diagrams. 10M

(P.T.O..)

15. A). i) Discuss the internal and external causes of over voltages in a power system. 5M
ii) Explain insulation coordination of lines. 5M

OR

15. B). i) What is lightning. Describe the mechanism of lightning discharge? 5M
ii) Explain Zinc-oxide type lightning arrester. 5M



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech V Semester Supplementary Examinations December-2024

Course Name: Power Electronics

(Electrical & Electronics Engineering)

Date: 23.12.2024 AN

Time: 3 hours

Max.Marks:70

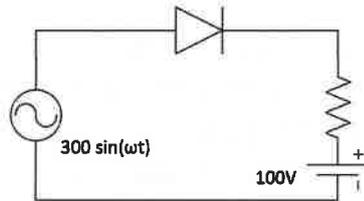
(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks. 10x2=20M

1. The peak inverse voltage required for the diode shown in the figure below is 2 M



2. Define latching current and holding current. 2 M
3. In a single-phase full wave controlled bridge rectifier, maximum output voltage and minimum output voltage are obtained at which firing angles. 2 M
4. Define firing angle. 2 M
5. If T_{on} is the ON period and D is the duty cycle of a DC-DC converter, then the switching frequency is. 2 M
6. A buck converter has the following parameters: $V_{in} = 15\text{ V}$, $D = 0.6$, $L = 10\ \mu\text{H}$, $C = 50\ \mu\text{F}$, and $R = 5\ \Omega$. The switching frequency is 250 kHz. Assuming continuous conduction. Find the output voltage. 2 M
7. Classify various inverters circuits. 2 M
8. A single phase full bridge inverter has a DC voltage source $V_s = 230\text{ V}$. The RMS value of the fundamental component of output voltage is. 2 M
9. What is the function of Cyclo converter? 2 M
10. What are the types of AC voltage controllers? 2 M

PART-B

Answer the following. Each question carries TEN Marks. 5x10=50M

- 11.A). What is power MOSFET? What are the types of power MOSFET? Draw the structure of a power MOSFET and explain its operating principle in briefly. 10M
- OR**
11. B). Explain Class C and Class D commutation of SCR. 10M
12. A). Explain the operation of single phase full-wave controlled rectifier using center tapped transformer with R-L load under discontinuous mode of operation? Draw the waveforms of output voltage, voltage across SCR and average load current for $\alpha = 60^\circ$. 10M
- OR**
12. B). Explain the functional modes of dual converters with necessary waveforms. 10M

(P.T.O.)

13. A). Explain the operating principle of dc step down chopper with a suitable diagram. Draw the voltage and current waveforms of chopper. Derive expressions for average output voltage and rms output voltage. 10M

OR

13. B). A buck converter has the input voltage of 220 V and it operates at 1 kHz, when the average load current is 50 A, the load resistance is 3 Ω . Determine the value of inductance to limit the maximum peak to peak ripple current through inductor to 10% and find the value of inductance for maximum ripple current. 10M

14. A). What are pulse width modulated inverters? What are the different PWM techniques used in inverter? 10M

OR

14. B). Discuss in detail about the functioning of three phase voltage source inverter in 120° operating modes. 10M

15. A). A single –phase half –wave ac voltage controller is connected with a load of $R = 5 \Omega$ with an input voltage of 230 V, 50 Hz. If the firing angle of thyristor is 45°, determine i) RMS output voltage, ii) Power delivered to load. 10M

OR

15. B). Explain operating principle of single phase to single phase step up cyclo converter using bridge converters. Mention the conduction of various thyristors in the waveforms. 10M

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R18

Course Code: A30213



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech V Semester Supplementary Examinations December-2024

Course Name: Electrical Measurements

(Electrical & Electronics Engineering)

Date: 26.12.2024 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks.

10x2=20M

1. Define standardization. 2 M
2. Give the applications of measurement systems. 2 M
3. What is the range of medium resistance? 2 M
4. Name the methods used for medium resistance measurement. 2 M
5. State the balance equation used in ac bridges. 2 M
6. Name the bridge circuits used for the measurement of capacitance. 2 M
7. State the advantages of Ballistic Galvanometer. 2 M
8. Give the different applications of Flux meter. 2 M
9. State the advantages of a DVM over an analog meter. 2 M
10. What are the specifications of digital voltmeters? 2 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Draw the circuit diagram of a Crompton's potentiometer and explain its working. Describe the steps used when measuring an unknown resistance. 10M
- OR**
- 11.B). A basic slide wire potentiometer has a working battery voltage of 3V with negligible internal resistance. The resistance of slide wire is 400 Ω and its length is 200 cm. A 200 cm scale is placed along the slide wire. The slide wire has 1 mm scale divisions and it is possible to read upto 1/5 of a division. The instrument is standardized with 1.018 V standard cell with sliding contact at the 101.8 cm mark on scale. Calculate: (i) Working current (ii) The resistance of series rheostat (iii) The measurement range (iv) The resolution of instrument. 10M
12. A). What are the difficulties encountered in the measurement of High resistances. 10M
- OR**
12. B). Demonstrate the working of Kelvin's Double Bridge and derive the equation for its balance condition. 10M
13. A). Describe working of a low voltage Schering bridge. Derive the equation for capacitance and dissipation factor. Draw the phasor diagram of the bridge under Conditions of balance. 10M
- OR**
13. B). Execute the working of Hay's bridge for measurement of inductance. Derive the equations for balance condition. 10M

(P.T.O..)

14. A). What are the methods available for determination of B.H. Curve? 10M

OR

14. B). Demonstrate operation of Ballistic Galvanometer with a neat diagram. 10M

15. A). Explain with neat diagrams the working of integrating type DVM. 10M

OR

15. B). Find the resolution of a $3\frac{1}{2}$ digital voltmeter which is used for measuring voltage. How would a voltage of 14.42 be displaced on 10 V range? How would be a reading 14.42 be displaced on 100 V range? 10M

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R18

Course Code: A30232



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech V Semester Supplementary Examinations December-2024

Course Name: Electrical Instruments

(Electrical & Electronics Engineering)

Date: 30.12.2024 FN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks.

10x2=20M

- | | | |
|-----|--|-----|
| 1. | How can you extend the range of voltmeter? | 2 M |
| 2. | What are the Errors in moving iron Instruments? | 2 M |
| 3. | Define Ratio and phase angle errors. | 2 M |
| 4. | Mention the types of Power factor meters and frequency meters. | 2 M |
| 5. | Write the formula for three phase active and reactive powers. | 2 M |
| 6. | Draw the circuit diagram for measurement of three phase active power by using two watt meter method. | 2 M |
| 7. | What are the main sources of errors in energy meters? | 2 M |
| 8. | How creeping adjustment is provided in induction type single phase energy meter? | 2 M |
| 9. | Define the Transducer. | 2 M |
| 10. | Distinguish between active and passive electrical transducers. | 2 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | | |
|--------|--|----|
| 11.A). | i) Develop the torque equation for a MI instrument and mention few applications. | 5M |
| | ii) Explain about the electrostatic voltmeter. | 5M |

OR

- | | | |
|--------|---|----|
| 11.B). | i) Describe the construction and working principle of attraction type moving iron instrument. | 5M |
| | ii) How can you extend the range of Electrostatic Voltmeters? Explain. | 5M |

- | | | |
|--------|--|----|
| 12.A). | i) Derive expression for actual transformation ratio, ratio error and phasor angle error of a P.T. | 5M |
| | ii) A current transformer with bar primary has 300 turns in its secondary winding. The resistance and reactance of the secondary circuit are 1.5Ω and 1.0Ω respectively, including the transformer winding. With 5A flowing in the secondary winding, the magnetizing mmf is 100AT and the core loss is 1.2 W. Determine the ratio and phase angle errors? | 5M |

OR

- | | | |
|--------|---|-----|
| 12.B). | Explain about the types of power factor meters with neat sketch. | 10M |
| 13.A). | Analyze the Measurement of three phase power by using (i) single wattmeter method (ii) Three wattmeter method with neat sketch. | 10M |

(P.T.O..)

OR

13. B). i) Prove that for electro-dynamometer type wattmeter true power = $\{\cos \Phi / [\cos \beta \cos (\Phi - \beta)]\}$ x actual wattmeter reading, Where $\cos \Phi$ = power factor of the circuit, $\beta = \tan^{-1}(\omega L/R)$, where L and R are the inductance and resistance of the pressure coil of the circuit. 6M
ii) Explain about the measurement of three phase reactive power by using single watt meter method. 4M

14. A). i) Explain the operation of induction type energy meter and explain how you can provide overload compensation to it. 5M
ii) How can you test energy meter by phantom loading? Explain with a neat sketch. 5M

OR

14. B). i) With the help of neat sketch explain the construction of a three-phase induction type energy meter and its principle of operation. 5M
ii) An energy meter is designed to make 100 revolutions of the disc for one unit of energy. Calculate the number of revolutions made by it when connected to a load carrying 20A at 230volts at 0.8 pf for an hour. If it actually makes 360 revolutions, find the percentage error. 5M

15. A). i) Explain the method of measuring displacement using LVDT with a suitable diagram and State the advantages and disadvantages of LVDT. 5M
ii) Describe with suitable diagrams the working principle of thermo couples. 5M

OR

15. B). i) Explain the working principle of strain gauge. Derive its gauge factor. 5M
ii) Explain the working principle of Thermistors, mention advantages and applications of them. 5M

H.T No:

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R18

Course Code: A30233



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech V Semester Supplementary Examinations December-2024

Course Name: Electric Smart Grid Technologies
(Electrical & Electronics Engineering)

Date: 30.12.2024 FN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks.

10x2=20M

1. Define smart grid concept and explain its necessity. 2 M
2. Explain the difference between smart grid and Traditional grid. 2 M
3. What is Sub-station Automation? 2 M
4. List the components of smart grid. 2 M
5. Define distributed generator. 2 M
6. List the different types of distributed generators. 2 M
7. What is the importance of load flow studies in relation to a traditional grid system and within a smart grid? 2 M
8. What is the purpose of load flow studies? 2 M
9. What is synchro phasor? 2 M
10. Give the Applications of Phasor Measurement Unit. 2 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Enumerate the initiatives taken by Indian economy for smart grid. 10M
- OR**
11. B). Describe the smart grid functions in detail. 10M
12. A). With a neat sketch describe the Architecture of the smart grid. 10M
- OR**
12. B). What is Smart sub-station automation and describe smart substation automation. 10M
13. A). Describe the different types of storage technologies for smart grids. 10M
- OR**
13. B). Describe the construction and working principle of a fuel cell. 10M
14. A). Explain the importance and challenges of load studies in smart grid. 10M
- OR**
14. B). With a neat sketch explain the DSOPF applied the smart grid. 10M
15. A). Generalize the Phasor Measurement Unit application for monitoring & explain the protection also. 10M
- OR**
15. B). Define microgrid and explain load frequency control in a Microgrid. 10M
