B.L.D.E.A's V.P.Dr.P.G.HALAKATTI COLLEGE OF ENGINERING AND TECHNOLOGY VIJYAPUR 586103

INDEX FILE 7 & 8th SEMESTER QUESTION PAPERS JAN/FEB 2023

5th, 7TH and 8th SEMESTER

ELECTRICAL AND ELECTRONICS DEPARTMENT

CBCS SCHEME

USN | | | | | | | | | | |

15EE71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Power System Analysis – II

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a.   Define the primitive network. Give the representation of primitive network impedance and admittance form.   **(06 Marks)**

    b.   The primitive admittance of lines are as shown in Fig.Q1(b). Form the Y_{BUS} using Singular Transformation Method.
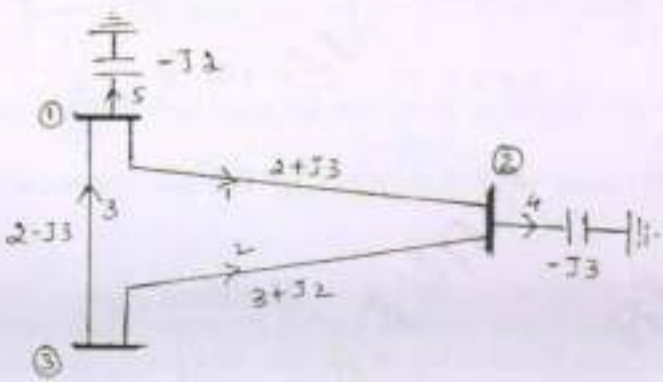
Fig.Q1(b)   **(10 Marks)**

OR

2   a.   Explain the following terms with an example :
        i) Tree   ii) Co-tree   iii) Basic cutsets.   **(06 Marks)**

    b.   In the power system shown in Fig.Q2(b), the line 1 – 2 has the series impedance of $(0.04 + J0.12)$pu with neglible line charging. The generation and load data is in the table.

Bus no.	Type	Generation (pu)		Load in pu	
1	Slack	–	–	–	–
2	PV	0.3	–	0.6	0.2

Fig.Q2(b)

The slack bus in 1∠0 . The voltage at bus 2 is to be maintained at 1.05pu and the generation at this bus has Q – generation limits between 0 and 0.5pu. Determine voltage at bus 2 at the end of first iteration, using GS load flow method.   **(10 Marks)**

Module-2

3 a. Explain the algorithm for fast decoupled load flow analysis, clearly starting the assumptions made. (08 Marks)
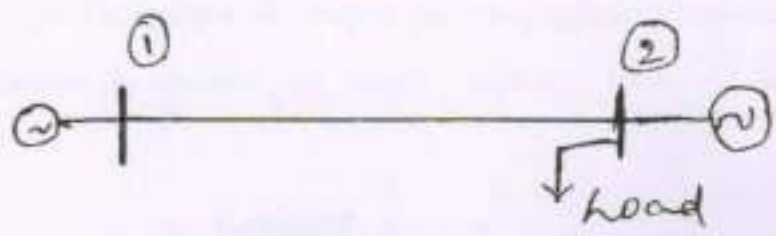
b. For power system shown in Fig.Q3(b). Using NR method, write the Jacobbian matrix.
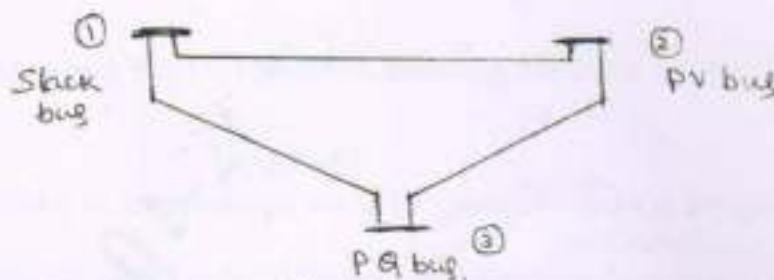
Fig.Q3(b)

(08 Marks)

OR

4 a. Explain the algorithm procedure for load flow analysis using Newton – Raphson's (NR) method. (08 Marks)

b. Compare Gauss – Seidal and Newton – Rampson method of load flow analysis. (08 Marks)

Module-3

5 a. With the help of neat diagram, explain the performance curves of generating unit. (08 Marks)

Incremental fuel cost in rupees per hour for a plant consisting of two units are :

$$\frac{dC_1}{dP_1} = 0.20 P_1 + 40 \ Rs|MW$$

$$\frac{dC_2}{dP_2} = 0.25 P_2 + 30 \ Rs|MW$$

Assume that both units are operating at all times and total load varies from 40MW to 250 MW. The maximum and minimum loads on each units are to be 125MW and 20MW respectively. How will load be shared between the two units as system load varies over a fuel range? For 150MW, what are the corresponding values of each plants and its incremental cost. (08 Marks)

OR

6 a. Describe dynamic programming method for computation of optimal unit commitment. (08 Marks)

b. With a usual notations, derive the generalized transmission loss formula and B – co-efficient. (08 Marks)

Module-4

7 a. Explain power system static security level classification. (08 Marks)

b. Discuss the problem formation and procedure of optimal scheduling for hydro thermal plant. (08 Marks)

OR

8 a. Explain with the help of flow chart, optimal load flow solutions. (08 Marks)
   b. Explain the state space method used for power system reliability evolution. Explain loss of load probability. (08 Marks)

Module-5

9 a. Explain the modified Euler's method used in solution of swing equation for transient stability studies. (08 Marks)
   b. Form the Z_{bus} for the power system shown in Fig.Q9(b) using Z_{bus} building algorithm. Select ground node as reference. The line reactance are in pu.
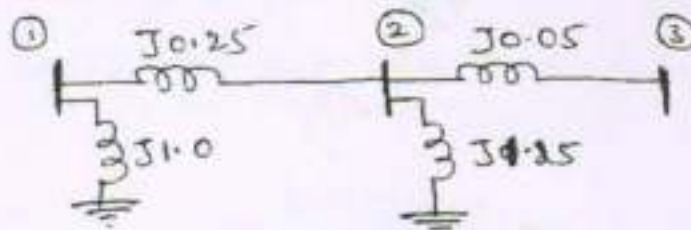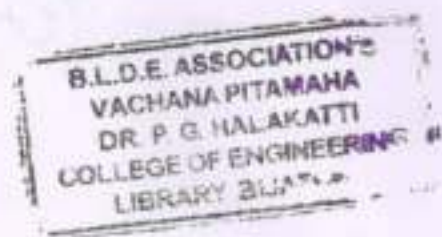

Fig.Q9(b) (08 Marks)

OR

10 a. Derive the generalized algorithm for finding the elements of bus impedance matrix when a link is added. (08 Marks)
    b. Discuss the steps for determining multi machine stability. (08 Marks)

* * * * *

USN | | | | | | | | | | | 15EE72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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. Briefly explain the types of faults that occur in Power System. (04 Marks)
   b. Explain the primary and backup protection in case of relays. (06 Marks)
   c. Explain the essential qualities of protective relaying. (06 Marks)

OR

2. a. With the help of a neat diagram, explain the construction and working of an shaded pole type induction relay. (06 Marks)
   b. Briefly explain the duality between amplitude and phase comparators. (04 Marks)
   c. List down six points of comparison between Electromechanical relays and Numerical relays. (06 Marks)

Module-2

3. a. Classify the different types of over current relays based on their time current characteristics. (06 Marks)
   b. Two relays R_1 and R_2 are connected in two sections to a feeder as shown in Fig. Q3(b) below : Relay R_1 : CT ratio = 300/5 , Plug setting = 50% , TMS = 0.3.
      Relay R_2 : CT ratio = 500/5 , Plug setting = 75%.
      Operating characteristics is below table 1.

PSM	2	4	5	8	10	20
Op. time (secs)	10	5	4	3	2.8	2.4

Table 1.

   A fault at F results in a fault current of 3000A. Find TMS of R_2 to give time – grading margin of 0.5sec between the relays. (06 Marks)

Fig. Q3(b)
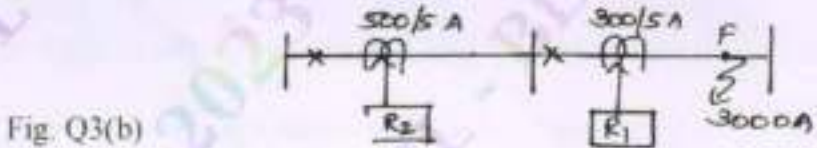
   c. Briefly explain the over current protective scheme for parallel feeders. (04 Marks)

OR

4. a. Starting from the torque equation, explain the Operating characteristics of an impedance relay. (06 Marks)
   b. Explain the term 'reach' as in the case of a distance relay. Also explain how does a distance relay over – reach and under – reach during its sequence of operation. (06 Marks)
   c. Compare the effect of line length and source impedance on distance relays, with a suitable example. (04 Marks)

Module-3

5. a. Explain the Transley scheme protection with respect to pilot relaying schemes. (08 Marks)
   b. With the help of a neat diagram, explain the construction and working of a percentage biased differential relay. (08 Marks)

4

OR

6 a. Explain briefly the following with respect to protection of generators :
   i) Restricted earth fault protection   ii) Loss of excitation.   (08 Marks)

b. A three phase 11KV/33KV , Y – Δ connected power transformer is protected by differential protection. The CTs on the LV side have current ratio of 400/5. What must be the ratio of CTs on the HV side show the connection with the help of a neat diagram?   (08 Marks)

Module-4

7 a. With neat diagram and waveforms, explain the phenomenon of interruption of capacitive currents in a circuit breaker.   (08 Marks)

b. In a 132 kv system, the inductance and capacitance upto the location of the circuit breaker are 0.4H and 0.015µF respectively. Determine
   i) the maximum value of restriking voltage across the contacts of the circuit breaker.
   ii) frequency of transient oscillation and maximum value of RRRV.   (08 Marks)

OR

8 a. Explain the properties of an SF_6 gas.   (08 Marks)

b. Write short notes on :
   i) Unit testing   ii) Synthetic testing of circuit breakers.   (08 Marks)

Module-5

9 a. Explain the cut off characteristics of fuse.   (06 Marks)

b. Explain the constructional details and working of an HRC fuse, with the help of a neat diagram.   (06 Marks)

c. List the various causes of over voltage in power system.   (04 Marks)

OR

10 a. Explain the working of Klydonograph Instrument.   (06 Marks)

b. Briefly explain the working of a surge diverter.   (04 Marks)

c. Explain the various components of GIS briefly.   (06 Marks)

* * * * *

USN | | | | | | | | | | 15EE73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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 airgap that is $i = i_o e^{\alpha d}$ considering Townsend first ionization co-efficient. **(06 Marks)**
   b. Explain briefly suspended particle theory of breakdown in liquid dielectric. **(06 Marks)**
   c. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8}A at 8KV at a distance of 0.4cm between the plane electrodes keeping the field constant and reducing the distance of 0.1cm results in a current of 5.5×10^{-9}A. Calculate Townsend's primary ionization coefficient 'α'. **(04 Marks)**

OR

2 a. Explain the following mechanism in solid:
      i)   Electromechanical breakdown
      ii) Thermal breakdown. **(08 Marks)**
   b. What is Paschen's law? How do you account for the minimum voltage for break down under a given "$P \times D$" condition? **(08 Marks)**

Module-2

3 a. Explain the working of Cockcraft-Walton voltage multiplier circuit schematic diagram. **(08 Marks)**
   b. Explain the 3-stage cascaded transformes for generation of HVAC. List the advantages of high frequency transformers. **(08 Marks)**

OR

4 a. Explain the Mark's circuit arrangement for multistage impulse generator with a neat diagram. **(08 Marks)**
   b. An impulse generator has eight stages with each condenser rated for 0.16μF and 125kV. The load capacitor is of 1000pF. Find the series and damping resistance needed to produce 1.2/50μs impulse wave. What is the maximum output voltage of the generator if the charging voltage is 120kV? **(08 Marks)**

Module-3

5 a. Describe Chubb and Eortescue method for measurement of peak value of an AC voltage. **(08 Marks)**
   b. Explain principle, working and construction of electrostatic voltmeter. **(08 Marks)**

OR

6 a. Explain the cathode ray oscilloscope for impulse measurement. **(10 Marks)**
   b. Explain with schematic diagrams how DC current can be measured using DC current transformers. **(06 Marks)**

1 of 2

6

Module-4

7 a. Explain the different theories of charge formation in clouds. (08 Marks)
   b. Explain the different methods employed for lighting protection of overhead lines. Explain them. (08 Marks)

OR

8 a. Explain with suitable figures the principles and functioning of   i) Expulsion gaps
      ii) Protector tubes. (10 Marks)
   b. A 3-phase single circuit transmission line is 400km long. If the line is rated for 220kV and has the parameters R = 0.1Ω/km, L = 1.26mH/km, C = 0.009µF/km and G = 0. Find: i) The surge impedance   ii) The velocity of propagation neglecting the resistance of the line. If a surge of 150kV and infinitely long tail strikes at one end of the line, what is the time taken for the surge to travel to the other end of the line? (06 Marks)

Module-5

9 a. Discuss the method of discharge detection using straight detector. (08 Marks)
   b. Describe a high voltage Schering bridge to measure the capacitance and dissipation factor of sample of dielectric with neat diagram. (08 Marks)

OR

10 a. Explain in detail the testing of circuit breaker and insulators. (08 Marks)
    b. Explain with a schematic diagram, the synthetic testing procedure on valve units in HVDC systems. (08 Marks)

* * * * *

7

USN | | | | | | | | | |

15EE742

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Utilization of Electric Power

Time: 3 hrs.

Max. Marks: 80

Note: *1. Answer FIVE full questions, choosing ONE full question from each module.*
2. Missing data, if any, may be suitably assumed.

Module-1

1   a. A cubic water tank has surface area of $6m^2$ and is filled to 90% capacity 6 times daily. The water is heated from 20°C. to 65°C. The losses per square meter of the tank surface per degree centigrade temperature difference is 6.3W. The specific heat of water is 4,200J/kg/°C. Find the loading in KW and the efficiency of the tank. **(07 Marks)**

   b. Explain the factors affecting electro deposition. **(04 Marks)**

   c. With a neat sketch, explain the working of coreless conduction furnace. **(05 Marks)**

OR

2   a. A slab of resin $150cm^2$ in area and 2 cm thick is to be heated by dielectric heating. The power required is 200watts and the frequency of supply is 30MHz. The relative permittivity of resin is 5 and the p.f. is 0.05. Determine the voltage required and the current flowing through the material. If the voltage is limited to 600V, find the new value of the frequency of the supply required. **(06 Marks)**

   b. Explain the spot welding with a neat diagram. **(05 Marks)**

   c. Explain the Faraday's laws of Electrolysis. **(05 Marks)**

Module-2

3   a. Define MHCP, luminous flux and luminous intensity pertaining to illumination. **(06 Marks)**

   b. Two lamps of candle powers 500 and 1,200 are hung at a height of 15 meters from ground level. Distance between the lamp is 5m. Find the illumination at a point on the ground directly blow 1200 candle power. **(04 Marks)**

   c. Explain the operation of mercury vapour lamp. **(06 Marks)**

OR

4   a. A lamp of luminous intensity 1200C.P is mounted at a height of 12m above centre of circular area 20m in diameter. Determine the maximum and minimum illumination produced on the area. **(04 Marks)**

   b. What are the requirements of good lighting system? **(05 Marks)**

   c. Discuss on factory lighting and street lighting system. **(07 Marks)**

Module-3

5   a. Define tractive effort and derive an expression for tractive effort required for propulsion of train considering gradient and resistance to train. **(08 Marks)**

   b. A train runs between two station which are 2 km apart with an average speed of 50 kmph maximum speed limited to 72 kmph. Acceleration of the train is 1.8 kmphps and coasting retardation is 0.16 kmphps and the braking retardation is 3.6 kmphps. Determine the duration of acceleration, coasting and braking. **(08 Marks)**

8

OR

6 a. Assume a trapezoidal speed curve and device an expression for the maximum speed.
(08 Marks)

b. A 200 tonne train with motor coach is driven by 4 motors, each developing a toque of 6000Nm during acceleration. The train is moving up a gradient of 3%, gear ratio is 4, gear transmission efficiency is 90%, wheel radius is 45cm, train resistance is 50N/tonne, rotational inertia 10%. Calculate the time taken to attain speed of 50kmph. If the line voltage is 3000V DC and efficiency of the motor is 85%, find the current drown during the notching up period.
(08 Marks)

Module-4

7 a. Explain regenerative braking applied to DC service motor.
(08 Marks)

b. Explain system of traction with their merits and demerits.
(08 Marks)

OR

8 a. What is regenerative braking? Derive an expression for energy returned during regeneration.
(08 Marks)

b. Explain different current collector scheme used in traction.
(08 Marks)

Module-5

9 a. Explain possible configuration of electric vehicle with illustrative diagram.
(08 Marks)

b. With a neat diagram, explain the configuration of series hybrid electric vehicle train. Mention its advantages.
(08 Marks)

OR

10 a. Discuss on the performance of electric vehicle with respect to traction motor characteristics.
(08 Marks)

b. With a diagram explain separated axle torque combination parallel hybrid electric train.
(08 Marks)

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐ 15EE752

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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. Mention tools and accessories required for installation and maintenance of electrical equipment. (06 Marks)
   b. Explain in detail points to be considered in selection of site and installation of power transformer. (10 Marks)

OR

2 a. Explain any three India electricity rules. (06 Marks)
   b. What is Drying of Transformers? Explain drying of transformer by hot air circulation. (10 Marks)

Module-2

3 a. What are the standard specifications of synchronous machines as per BIS? (04 Marks)
   b. Explain excitation system in synchronous machines. (04 Marks)
   c. Explain slip test to calculate X_d and X_q in synchronous machines. (08 Marks)

OR

4 a. Explain sudden short circuit test on 3-φ generator. (06 Marks)
   b. Mention the different test carried out on synchronous machines. (04 Marks)
   c. Write note on drying out of synchronous machines. (06 Marks)

Module-3

5 a. Write note on shaft alignment of induction motors. (08 Marks)
   b. Mention different commissioning tests carried out on induction motors. (04 Marks)
   c. Mention the factors to be considered for selection of bearings for induction motors. (04 Marks)

OR

6 a. Explain in detail installation of induction motors. Also give foundation details. (08 Marks)
   b. Explain different types of temperature rise test in induction motors. (08 Marks)

Module-4

7 a. Write note on laying of underground cables in special location. (10 Marks)
   b. Explain location of faults using megger. (06 Marks)

OR

8 a. Write note on testing of cables. (08 Marks)
   b. Write note on transportation and handling of cables. (08 Marks)

Module-5

9 a. Mention specifications of high voltage circuit breaker. (06 Marks)
   b. Explain maintenance of circuit breaker. (06 Marks)
   c. Write note on testing of electrical installation of a building. (04 Marks)

OR

10 a. Mention type tests and routine tests on high voltage A.C. circuit breaker. (10 Marks)
   b. Write note on testing of insulation and resistance between conductors continuity. (06 Marks)

* * * * *

10

USN | | | | | | | | | | | | 18EE71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Power System Analysis – 2

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Define the following with example:
   i)   Oriented graph
   ii) Basic loop
   iii) Co-tree.   (06 Marks)

   b. What is primitive network? Give the representation of a typical component and arrive at their performance equation in impedance and admittance form.   (06 Marks)

   c. The below Fig.Q.1(c) shows the one-line diagram of a simple four-bus system, Table Q.1(c) gives the line impedances identified by the buses on which these terminates. The shunt admittances at all the buses is assumed to be negligible.
   i)   Find Y_{bus} assuming that the line shown dotted is not connected
   ii) What modification need to be carried out in Y_{bus} if the line shown dotted is connected?

Fig.Q.1(c)

Table Q1(c)

Line (bus to bus)	R (pu)	X (pu)
1 – 2	0.05	0.15
1 – 3	0.10	0.30
2 – 3	0.15	0.45
2 – 4	0.10	0.30
3 – 4	0.05	0.15

(08 Marks)

OR

2 a. With usual notation, deduce the expression for Y_{bus} using singular transformation method.   (06 Marks)

   b. Determine Y_{bus} by singular transformation of the system with data as given in Table Q.2(b)   (08 Marks)

Table Q.2(b)

Element No.	1	2	3	4	5
Bus code (p-q)	0-1	1-2	2-3	3-0	2-0
Self admittance y_{pq-pq}	1.4	1.6	2.4	2.0	1.8

1 of 4

11

c. The bus incidence matrix A for a network of 8 elements and 5 nodes (4-buses) is given in Table Q.2(c). Reconstruct the oriented graph. Hence obtain the one-line-diagram of the system indicating the generator position. (06 Marks)

Table Q.2(c)

$$A = \begin{array}{c|cccccccc} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ \hline ① & 1 & 0 & 0 & 0 & -1 & 0 & -1 & 0 \\ ② & 0 & 1 & 0 & 0 & 1 & -1 & 0 & -1 \\ ③ & 0 & 0 & 1 & -1 & 0 & 1 & 0 & 0 \\ ④ & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1 \end{array}$$

Module-2

3 a. Why load flow analysis in power system is necessary? Explain. (06 Marks)

b. What is the data required to conduct load flow analysis? Discuss the need of acceleration factor in load flow solution. (06 Marks)

c. Obtain the load flow solution using Gauss-Seidal method at the end of one iteration of the power system shown in Fig.Q.3(c). The data is given in Table Q.3(c)-1 and Table Q.3(c)-2.
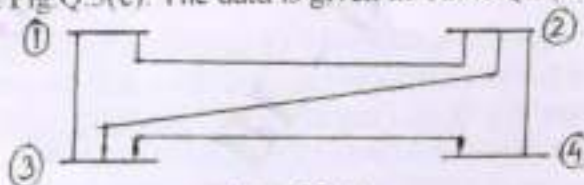
Fig.Q.3(c)

Table Q.3(c) – 1
Line data

S. B.	E. B	R (PU)	X(PU)
1	2	0.05	0.15
1	3	0.10	0.30
2	3	0.15	0.45
2	4	0.10	0.30
3	4	0.05	0.15

Table Q.3(c) – 2
Bus data

Bus No	P_i(p.u)	Q_i (p.u)	V_i
1	-	-	1.04 ∠0
2	0.5	-0.2	-
3	-1.0	0.5	-
4	0.3	-0.1	-

(08 Marks)

OR

4 a. Explain how buses are classified for load flow study. (06 Marks)

b. Discuss operating constraints in load flow analysis. (06 Marks)

c. For the three bus system shown in Fig.Q.4(c), use Gauss-Seidel method and determine the voltages at bus 2 and bus 3 at the end of first iteration. Line impedances marked on the diagram are in p.u. The information relating to bus data is given in Table Q.4(c).
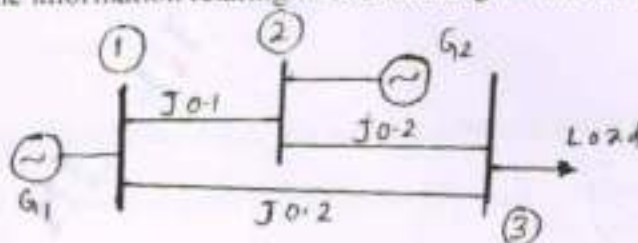
Fig.Q.4(c)

Table Q.4(c)

Bus No.	Type	Generation		Load		Voltage magnitude $\|V\|$	Reactive Power Limit	
		P	Q	P	Q		Q_{min}	Q_{max}
1	Slack	-	-	-	-	1.0	-	-
2	PV	5.32	-	-	-	1.1	0	5.32
3	PQ	-	-	3.64	0.53	-	-	-

(08 Marks)

Module-3

5 a. Discuss the algorithm procedure for load flow analysis using Newton-Raphson's method in polar coordinates. **(06 Marks)**

   b. Obtain the voltages at all buses for three bus system shown in Fig.Q.5(b) at the end of first iteration by N-R method. The data is given in Table Q.5(b) – 1 and Table Q.5(b) – 2.
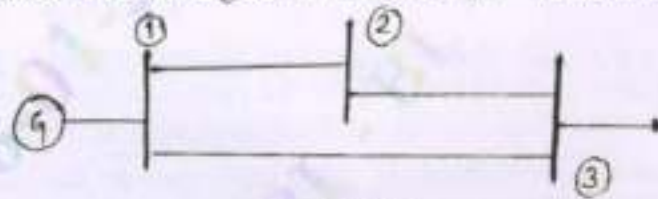
Fig.Q.5(b)

Table Q.5(b) – 1 Line data

SB	EB	R(pu)	X(pu)
1	2	0.0	0.1
1	3	0.0	0.2
2	3	0.0	0.2

Table Q.5(b) – 2 Bus data

Bus No.	P_G	Q_G	P_L	Q_L	V_{sp}
1(slack)	-	-	-	-	1.0
2 (pv)	5.3217	-	-	-	1.1
3 (PQ)	-	-	3.6392	0.5339	-

(08 Marks)

   c. Compare load flow methods with standard features. **(06 Marks)**

OR

6 a. Stating all assumptions, deduce FDLF model. Explain the step by step procedure for load flow solution using FDLF method. **(08 Marks)**

   b. Draw a flow chart for Fast Decoupled Load Flow (FDLF) method. **(06 Marks)**

   c. Derive expression for all elements of Jacobian matrices in polar form. **(06 Marks)**

Module-4

7 a. Explain the followings:
      i) Input-output curve
      ii) Heat rate curve
      iii) Incremental cost curve related to thermal plants. **(06 Marks)**

   b. The fuel inputs per hour of plant 1 and 2 are given as $F_1 = 0.2P_1^2 + 40P_1 + 120$ RS/hr ; $F_2 = 0.25P_2^2 + 30P_2 + 150$ RS/hr. Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading units is 100MW and 25MW, the demand is 180MW and transmission line losses are neglected. If the load is equally shared by both units, determine the saving obtained by loading the units as per equal incremental production cost. **(06 Marks)**

   c. Discuss the algorithm procedure for priority list method of unit commitment solution. **(08 Marks)**

3 of 4

13

OR

8 a. With usual notation, derive the generalized transmission loss formula and B-coefficient.

(08 Marks)

b. A system consists of two plants connected to a transmission line, the load is located at Plant-2. The power transfer of 100MW from station 1 to the load results in a loss of 8MW. Find the required generation at each station and the power received by the load, when the system, is operating with λ = RS 100/MWh. The incremental fuel cost of two plants are

$$\frac{dc_1}{dp_1} = 0.12P_1 + 65 \, RS/MWh \text{ and } \frac{dc_2}{dp_2} = 0.25P_2 + 75 \, RS/MWh.$$

(06 Marks)
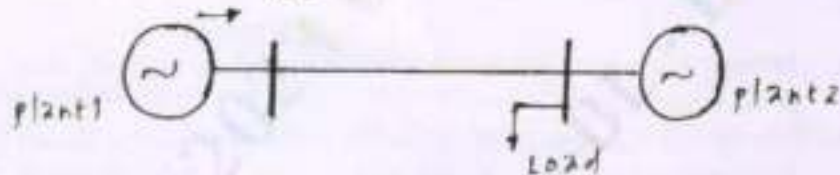
Fig.Q.8(b)

c. Draw the flow chart of dynamic forward DP approach for unit commitment.

(06 Marks)

Module-5

9 a. Obtain the generalized algorithm expression for bus impedance matrix elements when a link is added to the partial network. Also discuss the special cases.

(10 Marks)

b. Explain clearly the point-by-point method of solving swing equation. Mention the assumptions made.

(10 Marks)

OR

10 a. Obtain Z_{bus} by building algorithm for the system shown in Fig.Q.10(a). All values are in p.u. (impedance). Take bus '0' as reference bus. Add the elements in the order of ref. bus to bus1, ref. bus to bus2 and finally bus 1 to bus 2.

(10 Marks)
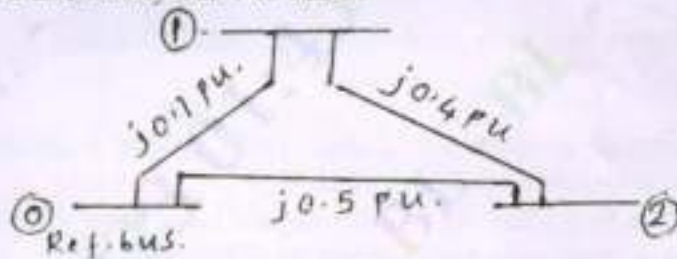
Fig.Q.10(a)

b. Describe the methodology of using Runge-Kutta technique for transient stability studies of a power system.

(10 Marks)

* * * * *

14

USN | | | | | | | | | |

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Power System Protection

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Explain various zones of protection of a power system with the help of schematic diagram.
(06 Marks)
 b. Explain various methods of backup protection. (06 Marks)
 c. Derive an expression for torque produced by an induction relay. (08 Marks)

OR

2 a. Give the comparison of electromagnetic relays and Numerical relays. (05 Marks)
 b. Explain the operation of induction cup type relay with the help of neat diagram. (07 Marks)
 c. Explain the various time – current characteristics of over current relays. (08 Marks)

Module-2

3 a. Give notes on protection of parallel feeders. (05 Marks)
 b. Explain the working of static impedance relay using Amplitude and phase comparator with the help of relevant diagram. (08 Marks)
 c. Explain the working of directional Earth fault Relay with the help of neat diagram.
(07 Marks)

OR

4 a. Fig Q4(a), show distance protection for a section of power system. The 1 zone setting at A and B is 150Ω.
 i) What will be impedance seen by the relay at A for a fault at F_1? Will the relay at A operate before the circuit breaker at B has tripped?
 ii) Will the relay at B trip for a fault at F_1 before the circuit breaker at A has tripped?
 iii) If the circuit breaker C_2 fails for a fault at F_2, will the fault be cleared by relays at A and B?
 iv) How will the fault at F_2 be cleared?
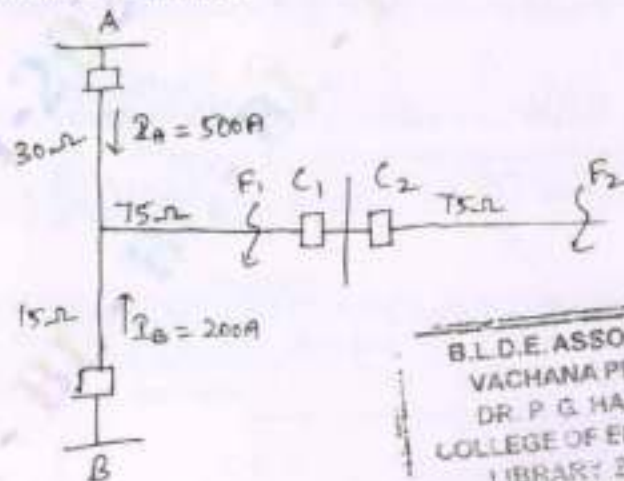
Fig Q4(a)   (08 Marks)

b. Write a notes on Reach of a Distance Relays. (04 Marks)
c. Explain in detail with the help of block diagram
   i) Static definite time overcurrent Relay
   ii) Static Inverse – time overcurrent relay (08 Marks)

Module-3

5 a. What are the different operating schemes used in wire pilot protection? Explain in detail about circulating current scheme and opposed voltage scheme. (08 Marks)
   b. Explain the working of Buchholz's relay with the help of neat diagram. (05 Marks)
   c. An 11kV, 100MVA alternator is grounded through a resistance of 5Ω. The C.T.S have a ratio 1000/5. The relay is set to operate when there is an out of balance current of 1A. What percentage of the generator winding will be protected by the percentage differential scheme of protection? (07 Marks)

OR

6 a. Write a note on :
   i) Stator – overheating protection of Generators.
   ii) Protection of Transformer against magnetizing inrush current. (08 Marks)
   b. Explain the working of biased (or) percentage differential relay with the help of neat schematic diagram and Derive its operating condition. (08 Marks)
   c. Give notes on Frame leakage protection. (04 Marks)

Module-4

7 a. Define. i) Restriking voltage ii) Recovery voltage.
   Derive the expression for Restriking voltage and Rate of Rise of Ristriking Voltage (RRRV). (10 Marks)
   b. With the help of neat diagram, explain the working of cross – blast and Axial-blast circuit breakers. (10 Marks)

OR

8 a. Write notes on :
   i) Recovery rate theory
   ii) Energy balance theory of arc interruption in a circuit breaker. (10 Marks)
   b. With a neat circuit diagram, explain the synthetic testing of a circuit breaker. (06 Marks)
   c. Describe the current chopping phenomenon in a circuit breaker. (04 Marks)

Module-5

9 a. What are the components of CRS? Briefly describe their functions. (08 Marks)
   b. Explain the construction and working of HRC cartridge fuse. (06 Marks)
   c. With a neat diagram, explain the construction and working of 'klydonograph'. (06 Marks)

OR

10 a. Explain the lighting phenomena with the help of relevant diagrams. (08 Marks)
   b. With the help of neat diagram, explain the working of Rod gap and Arcing horn to protect against Travelling waves. (08 Marks)
   c. Define : i) Fuse ii) Fusing factor. (04 Marks)

* * * * *

USN | | | | | | | | | | **18EE731**

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Solar and Wind Energy

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Briefly explain the importance of Non – Conventional Energy Sources.   (06 Marks)
    b.   Explain the classification of Energy Sources.   (08 Marks)
    c.   What are the types of Energy Audit and explain?   (06 Marks)

OR

2   a.   With a neat diagram, explain Latent heat storage in Thermal Energy System. (06 Marks)
    b.   Explain Extraterrestrial and Terrestrial radiations with a neat diagram.   (08 Marks)
    c.   Explain Spectral Power distribution of Solar radiation with neat diagram.   (06 Marks)

Module-2

3   a.   Define i) Angle of latitude   ii) Declination   iii) Hour angle.   (06 Marks)
    b.   What is meant by Pyranometer and explain the types of Pyranometer.   (08 Marks)
    c.   Briefly explain about Solar Radiation data.   (06 Marks)

OR

4   a.   Explain a typical liquid flat – plate solar collector with a neat diagram. (06 Marks)
    b.   With a neat diagram, explain Solar industrial heating systems.   (08 Marks)
    c.   Explain Lithium Bromide water absorption cooling system, with a neat diagram. (06 Marks)

Module-3

5   a.   Explain Solar cell I – V characteristics.   (06 Marks)
    b.   Explain Maximizing the Solar PV at pot and load matching.   (06 Marks)
    c.   With a neat diagram, explain Solar PV module.   (08 Marks)

OR

6   a.   Explain Maximum Power Point tracker with a neat diagram and draw I-V characteristics.
                                                                                     (08 Marks)
    b.   With the help of circuit diagram, explain Stand – Alone Solar PV system.   (06 Marks)
    c.   What are the Solar PV applications briefly explain?   (06 Marks)

Module-4

7   a.   Explain the considerations for the site selection of wind power generation. (08 Marks)
    b.   Derive the expression for power developed due to wind.   (06 Marks)
    c.   Write a note on The Nature of the wind.   (06 Marks)

OR

8   a.   Derive the expression for Forces on the blades and thrust on turbines due to wind. (08 Marks)
    b.   What are the benefits and problems of wind energy?   (06 Marks)
    c.   Briefly explain lift and drag type wind energy conversion.   (06 Marks)

17

Module-5

9 a. With a neat diagram, explain Horizontal axis using two aerodynamic blades. **(06 Marks)**
   b. Explain Variable Speed Constant Frequency with popular schemes in generating system. **(08 Marks)**
   c. List the advantages and disadvantages of Wind Energy Conversion System. **(06 Marks)**

OR

10 a. Explain the analysis of Aerodynamic forces acting on the blade. **(08 Marks)**
   b. List and explain the applications of Wind energy. **(06 Marks)**
   c. Explain Environmental aspects of Wind Energy Conversion System. **(06 Marks)**

* * * * *

USN | | | | | | | | | | |

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Utilization of Electrical Power

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. With a neat sketch, explain Ajax Wyatt furnace. (08 Marks)
   b. A 15 KW, 220 V single phase resistance oven employs Nickel Chrome wire for its heating elements. If the wire temperature is not to exceed 1000°C and the temperature of the charge is to be 600°C. Assuming radiating of efficiency as 0.6 and emissivity as 0.9. Calculate the diameter and length of wire. (08 Marks)
   c. Mention the advantages of electric heating. (04 Marks)

OR

2 a. State and explain Faraday's laws of electrolysis. (06 Marks)
   b. What is electro deposition? Discuss the factors influencing electro deposition. (06 Marks)
   c. Explain: (i) Flash butt welding (ii) Projection welding (08 Marks)

Module-2

3 a. Define:
      (i)   Luminous flux
      (ii) Luminous intensity
      (iii) MSCP
      (iv) Solid angle
      (v)   Lamp efficiency
      (vi) Space height ratio. (06 Marks)

   b. State and explain laws of illumination. (06 Marks)
   c. A lamp of 500 W and having MSCP of 1000 is suspended 2.7 m above the working plane. Calculate :
      (i)   The illumination directly below the lamp on the working plane
      (ii) Lamp efficiency
      (iii) Illumination at a point 2.5 m away on the horizontal plane from vertically below the lamp. (08 Marks)
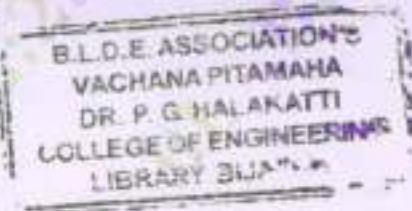
OR

4 a. With a neat diagram, explain the construction and working of a sodium vapour lamp. (06 Marks)
   b. Discuss briefly about the lighting fittings. (08 Marks)
   c. Write short note on street lighting and flood lighting. (06 Marks)

Module-3

5 a. Discuss the Mechanical and Electrical characteristics of electric traction motors. (06 Marks)
   b. Assume trapezoidal speed-time curve and derive the expression for maximum speed. (08 Marks)
   c. Define: (i) Crest speed (ii) Average speed (iii) Schedule speed (06 Marks)

OR

6 a. Derive an expression for tractive effort required for propulsion of a train considering gradient and resistance to the train movement. (08 Marks)

b. A 254 tonne motor-coach train with 4 motors takes 20 seconds to attain a speed of 40.25 kmph starting from rest on a 1 percent gradient. The gear ratio is 3.5 and gear efficiency 95%, wheel diameter 91.5 cm, train resistance 44 NW per tonne and rotational inertia 10% of the dead weight. Find the torque developed by each motor. (06 Marks)

c. Define specific energy consumption. What are the factors affecting specific energy consumption. (06 Marks)

Module-4

7 a. Write short note on compressed air brake and magnetic track brake. (08 Marks)

b. Explain how regenerative braking is obtained with single phase ac series motors and 3φ induction motors. (08 Marks)

c. What are the advantages and disadvantages of regenerative braking? (04 Marks)

OR

8 a. With a neat sketch, explain the function of a negative booster in a tramway system. (10 Marks)

b. Write short notes on:
   (i) Tramways
   (ii) Trolley bus
   (iii) Diesel electric traction (10 Marks)

Module-5

9 a. Explain the configuration of electric vehicles. (10 Marks)

b. Briefly explain the energy consumption in electric vehicles. (10 Marks)

OR

10 a. What are the advantages of electric vehicle over internal combustion engine vehicles? With a block diagram, explain the working principle of hybrid vehicles. (10 Marks)

b. With a neat diagram, explain series hybrid electric drive train (electric coupling). Mention the advantages of it. (10 Marks)

* * * * *

20

USN ☐☐☐☐☐☐☐☐☐☐   **18EE752**

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Electric Vehicles

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Explain the laws of motion of vehicle.   (06 Marks)
    b.   Explain the concept of constant FTR, Level road of vehicle.   (06 Marks)
    c.   An electric vehicle has the following parameter values :
       $m = 800$ kg, $CD = 0.2$, $AF = 2.2$ m^2, $C_0 = 0.008$, $C_1 = 1.6 \times 10^{-6}$ s^2/m^2
       Also, take density of air $\rho = 1.18$ kg/m^3 and acceleration due to gravity $g = 9.81$ m/s^2. The vehicle is on level road. It accelerates from 0 to 65 mph in 10S. Such that its velocity profile is given by,
       $v(t) = 0.29055t^2$ for $0 \le t \le 10S$
       i)   Calculate $F_{TR}(t)$ for $0 \le t \le 10S$
       ii)   Calculate $P_{TR}(t)$ for $0 \le t \le 10S$
       iii)   Calculate the energy loss due to non conservative forces E_{loss}.
       iv)   Calculate Δe_{TR} (08 Marks)

OR

2   a.   Explain the dynamics of vehicle motion.   (07 Marks)
    b.   Explain the concept of maximum gradeability of a vehicle.   (06 Marks)
    c.   Explain the concept of propulsion system design used for EV.   (07 Marks)

Module-2

3   a.   Discuss the variety of possible EV configurations due to variations in electric propulsion system and energy source with relevant block diagram.   (08 Marks)
    b.   Explain the characteristics of traction motor.   (05 Marks)
    c.   Explain the concept of energy consumption of EV.   (07 Marks)

OR

4   a.   List the different architecture of HEV's and explain the series hybrid drive trains with neat diagram.   (10 Marks)
    b.   Explain the torque coupling parallel hybrid drive trains with two shaft design configuration.   (10 Marks)

Module-3

5   a.   Explain the following battery parameters:
       (i)   Discharge rate   (ii) State of discharge   (iii) Depth of discharge   (06 Marks)
    b.   Explain with a neat sketch the working principle of LI-ION battery used for EV and EHV.   (08 Marks)
    c.   Find the curve-fitting constants n and λ for Peukert's equation for the two measurements available from a constant current discharge experiment of a battery.
       Find the curve-fitting constants n and λ for Peukert's equation for the two measurements available from a constant current discharge experiment of a battery.
       (i) $(t_1, I_1) = (10, 18)$
       (ii) $(t_2, I_2) = (1, 110)$ (06 Marks)

B.L.D.E. ASSOCIATION's
VACHANA PITAMAHA
DR. P. G. HALAKATTI
COLLEGE OF ENGINEERING
ISRAT BIJAPUR

21

OR

6 a. Explain with neat sketch the basic principle and operation of fuel cell. (08 Marks)
   b. List the different types of fuel cells and explain Proton Exchange Membrane Fuel Cell (PEMFC). (06 Marks)
   c. Explain in detail super capacitors used for EV and HEV. (06 Marks)

Module-4

7 a. Explain the functional block diagram of electric propulsion system. (07 Marks)
   b. Explain the torque-speed characteristics of induction motor used for traction application using constant volt/hertz control. (08 Marks)
   c. Explain the phase flux linkage based sensorless control to estimate the rotor position of SRM drive used for EV and HEV. (05 Marks)

OR

8 a. Explain the dc motor speed control using armature voltage and field control of electric propulsion system. (06 Marks)
   b. Explain with a neat block diagram the torque control of BLDC motor. (07 Marks)
   c. Explain the operation of SRM drive converter for EV. (07 Marks)

Module-5

9 a. Explain in detail-thermostat control strategy (engine on-off) used in vehicle controller. (08 Marks)
   b. Explain the concept of power rating design of traction motor. (06 Marks)
   c. Explain the concept of power rating design of the engine/generator. (06 Marks)

OR

10 a. Explain in detail the maximum state of change of peaking power source control strategy of parallel hybrid drive train. (12 Marks)
    b. Explain in detail energy storage design of parallel hybrid electric drive train design. (08 Marks)

* * * * *

USN | | | | | | | | | | 18EE754

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Electrical Energy Conservation and Auditing

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the following Energy sources with an examples : i) Primary & Secondary
     ii) Commercial and Non – commercial   iii) Renewable and Non - renewable. (12 Marks)
  b. Why Energy Conservation is important in the prevailing energy scenario? Explain. (08 Marks)

OR

2 a. List the salient features of Energy Conservation Act - 2001. (08 Marks)
  b. List the strategies for better energy security of the Nation. (06 Marks)
  c. How Energy pricing is done in India? Explain. (06 Marks)

Module-2

3 a. Define Power Factor and what are the effects of Lower power factor? (06 Marks)
  b. Write a note on : i) Maximum Demand controller   ii) Automatic Power factor controller. (08 Marks)
  c. Explain Electricity Billing. (06 Marks)

OR

4 a. Explain the following :   i) Energy Efficient motors   ii) Soft starter. (08 Marks)
  b. What are the different stages of performance evaluation of fans and mention the energy conservation opportunities in fan? (08 Marks)
  c. Write a note on Energy Efficient Lighting. (04 Marks)

Module-3

5 a. Define Energy Audit and explain why Energy audit is required? Mention its advantages. (10 Marks)
  b. Explain the different types of measuring equipment used in Energy Audit. (10 Marks)

OR

6 a. What is Energy use profile? What are the audits required for constructing the Energy use profile? (08 Marks)
  b. Give the TEN STEP methodology for detailed Energy Audit and explain. (12 Marks)

Module-4

7 a. Explain the different types of distinguish features of Electricity as a Commodity. (08 Marks)
  b. Explain Four pillers of market design. (12 Marks)

OR

8 a. Write a note on Framework of Indian Power Sector. (06 Marks)
  b. What is ABT? What are the broad features of ABT design? (08 Marks)
  c. Give the comparison between Existing Tariff and Availability Based Tariff (ABT). (06 Marks)

Module-5

9 a. Give Building recommendation for different climate zones of Indian States. (08 Marks)
   b. Explain Water Audit. (06 Marks)
   c. What is Demand Side Management? What are the scope of Demand Side Management. (06 Marks)

OR

10 a. Discuss Tariff options for DSM. Which tariffs promote DSM? (06 Marks)
   b. With a flow diagram, explain DSM planning and implementation. (08 Marks)
   c. Explain Load Management as a DSM strategy. (06 Marks)

* * * * *

24

USN | | | | | | | | | | |

17EE82

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
Industrial Drives and Applications

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. With the help of basic block diagram, explain the different parts of electrical drives system.
(08 Marks)

b. A motor equipped with a fly wheel is to supply a load torque of 1000N-m for 10sec followed by a light load period of 200N-m long enough for the flywheel to regain its steady-state speed. It is desired to limit the motor torque to 700N-m. What should be the moment of inertia of flywheel? Motor has an inertia of 10kg-m². What should be the moment of inertia of flywheel? Motor has an inertia of 10kg-m². Its no load speed is 500rpm and the slip at a torque of 500N-m is 5%. Assume speed-torque characteristic of motor to be a straight line in the region of interest.
(06 Marks)

c. Describe the operation of closed-loop toque control scheme and its application in battery powered vehicle or rail cars.
(06 Marks)

OR

2 a. With the help of relevant sketches, explain the multi quadrant operation of drives and the four quadrant operation of a motor driving a hoist load.
(10 Marks)

b. Obtain expressions for equivalent moment of inertia and load torque of a motor drive with
i) Translational   ii) Rotational motion loads.
(10 Marks)

Module-2

3 a. Obtain the thermal model of motor for heating and cooling. Also briefly explain heating and cooling curves.
(10 Marks)

b. Half hour rating of a motor is 100kW. Heating time constant is 80min and the maximum efficiency occurs at 70% full load. Determine the continuous rating of the motor. (06 Marks)

c. A constant speed drive has the following duty cycle:
i)   Load rising from 0 to 400kW : 5 minutes
ii)   Uniform load of 500kW : 5 minutes
iii) Regenerative power of 400kW returned to the supply : 4 minutes
iv)   Remains idle for : 2 minutes.
Estimate power rating of the motor. Assume losses to be proportional to (power)². (04 Marks)

OR

4 a. With the help of circuit diagrams and waveforms, explain the chopper control of separately excited dc shunt motor for
i)   Forward motoring and braking control
ii) Dynamic braking.
(10 Marks)

b. A 200V, 875rpm, 150A separately excited dc motor has an armature resistance of 0.06Ω. It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V, 50Hz. Assuming continuous conduction, calculate:
i)   Firing angle for rated motor torque and 750rpm
ii) Firing angle for rated motor torque and (-500)rpm
iii) Motor speed for α = 160° and rated torque.
(10 Marks)

Module-3

5 a. Name the methods employed for braking of an Induction motor? Explain in brief regenerative braking. **(10 Marks)**

b. A 400V, star connected, 3-ϕ, 6-pole, 50Hz induction motor has following parameters referred to the stator: $R_s = R_r' = 1\Omega$, $X_s = X_r' = 2\Omega$. Motor is to be braked by plugging from its initial full speed of 950rpm. Stator to rotor turns ratio is 2.3.
   i) Calculate the initial braking current and torque as a ratio of their full load values.
   ii) What resistance must be inserted in rotor circuit to reduce the maximum braking current to 1.5 times full load current? What will be initial braking torque now? **(10 Marks)**

OR

6 a. Explain the effect of unbalanced voltages and single phasing on the induction motor performance. **(10 Marks)**

b. A 2200V, 2600kW, 735rpm, 50Hz, 8 pole, 3-ϕ squirrel-cage induction motor has following parameters referred to the stator: $R_s = 0.075\Omega$, $R_r' = 0.1\Omega$, $X_s = 0.45\Omega$, $X_r' = 0.55\Omega$. Stator winding is delta connected and consists of two sections connected in parallel.
   i) Calculate starting torque and maximum torque as a ratio of rated torque, if the motor is started by star-delta switching. What is the maximum value of line current during starting.
   ii) What will be the maximum value of line current and torque during starting, if the part winding method of starting is employed? **(10 Marks)**

Module-4

7 a. Explain the operation of voltage source inverter fed induction motor drives. Also sketch various schemes of VSI fed induction motor drive. **(10 Marks)**

b. Explain the closed loop speed control for VSI controlled 3 phase induction motor. **(10 Marks)**

OR

8 a. Explain the operation of current source inverter fed induction motor drive. Also sketch various schemes of CSI induction motor drives. **(10 Marks)**

b. With the help of block diagram, explain the operation of closed loop slip controlled CSI drive with regenerative braking. Also list out the advantages and disadvantages of CSI drives over VSI drives. **(10 Marks)**

Module-5

9 a. Explain the self controlled synchronous motor drive employing load commutated thyristor inverter. **(10 Marks)**

b. With the help of circuit diagram, explain the drive circuits used for stepper motors. **(10 Marks)**

OR

10 a. Explain the brushless dc motor drive for servo applications. **(10 Marks)**

b. Explain the drive requirements for i) Textile mills ii) Steel rolling mills. **(10 Marks)**

* * * * *

26

CBCS SCHEME

USN ⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
Operation and Maintenance of Solar Electric Systems

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Define Peak Sun hours. With a neat diagram, show that the number of peak sun hours is less than the total number of hours in a day. **(06 Marks)**
  b. Explain the emerging technologies in the field of solar cell production. **(08 Marks)**
  c. Define cell efficiency. The standard value of power in irradiance is 1000 W/m². If the cell efficiency is 22% and 15%, for the same area of 0.2m². Calculate the total power output. **(06 Marks)**

OR

2 a. Draw a neat I-V and P-V characteristics of a solar cell. **(04 Marks)**
  b. Explain the importance of contacts in electrical connection in a PV cell. **(08 Marks)**
  c. Explain the procedure of creating an array using a PV module with a neat suitable diagram. **(08 Marks)**

Module-2

3 a. Differentiate between String, Multistring, Central and Modular Inverter. **(08 Marks)**
  b. With a neat diagram, explain net and gross metering. **(06 Marks)**
  c. What are ground mounting systems? Differentiate between Ground Rack mounts and Pole mounts. **(06 Marks)**

OR

4 a. Explain the function and position of circuit breakers and fuses in Balance of system. **(08 Marks)**
  b. Explain the concept of Pitched Roof mounts with a neat diagram. **(08 Marks)**
  c. List the functions of Grid interactive inverters. **(04 Marks)**

Module-3

5 a. Draw the diagram representing the orientation of the module installed in southern hemisphere. **(04 Marks)**
  b. Discuss on the various kinds of tools used in determining the shaded zone condition in any given location. **(08 Marks)**
  c. Write the importance of fault current protection while designing the PV system with an example. **(08 Marks)**

OR

6 a. What is meant by array and sub-array protection? **(04 Marks)**
  b. What are some of the energy efficiency initiatives taken to protect the PV system? **(06 Marks)**

1 of 2

c. For a PV systems to be installed in Berlin, Germany (Ambient temperature varies from −10°C to 40°C). Calculate the minimum and maximum number of modules in a string with the given data:

$V_{OC} = 30.2V$, $I_{SC} = 8.54A$, $V_{pm} = 24V$, $I_{pm} = 7.71A$, MPP voltage range = (268 − 480 V), Max DC voltage = 600 V, Safety margin for min and max inverter input voltage is 10% and 5% respectively. Temperature coefficient of $V_{OC} = −0.104$ V/°C. Temperature coefficient of $P_{max} = −0.485\%$ / °C. **(10 Marks)**

Module-4

7 a. Explain with a neat diagram, small scale power generators with utility grid. **(10 Marks)**
  b. Enumerate on the appropriate safety measures taken while installing PV systems. **(10 Marks)**

OR

8 a. What is system commissioning? List and explain the information to be including in the system documentation. **(10 Marks)**
  b. What is trouble shooting? Explain how the identification and the process of the problem is done in a PV system. **(10 Marks)**

Module-5

9 a. Explain the process of PV System Costing. **(10 Marks)**
  b. What is Feed in Tarrif's (FiTs)? Explain the important features of FiTs. **(10 Marks)**

OR

10 a. What is Rebate? Explain the important features of Rebate schemes. **(10 Marks)**
   b. List and explain some of the barriers of using PV technology. **(10 Marks)**

* * * * *

USN | | | | | | | |

18EE81

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
Power System Operation and Control

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. With a neat diagram, explain the general configuration and major components of SCADA system. **(10 Marks)**
   b. Explain in detail, the operating states of power system with a neat diagram showing transition between states. **(10 Marks)**

OR

2   a. Discuss the preventive and emergency control. **(06 Marks)**
   b. Explain the major components of energy management center. **(06 Marks)**
   c. Draw the typical diagram of RTU and explain major subcomponents. Discuss the standard protocols used in SCADA. Name the SCADA manufactured for power system. **(08 Marks)**

Module-2

3   a. Derive the mathematical model ALFC components speed Governor and turbine. **(10 Marks)**
   b. Given a control area with 3 generating units with following ratings :

Unit	Rating (MVA)	% R(on machine base)
1	200	0.01
2	500	0.025
3	750	0.04

The units are loaded as follows: P_1 = 100MW, P_2 = 400MW and P_3 = 600MW. If load increased by 200MW, what are new generations if D = 0? Repeat for D = 1.0. **(10 Marks)**

OR

4   a. Derive the generator model, load model and combined generator load model of ALFC system. **(10 Marks)**
   b. Two generators rated 200MW and 400MW are operating in parallel. The drop characteristics of their governors in 4% and 5% respectively for no-load to full load. The speed set points are such that the generator operate at 50Hz when they sharing the full load of 600MW in proportional to their rating.
      i) If the load reduces to 400MW, how load is shared? At what frequency will operate?
      ii) If now the speed changes are reset so that the load of 400MW is shared at 50Hz in proportional to their rating. What are no-load frequencies now? **(10 Marks)**

Module-3

5   a. Explain state space model of an Isolated system. **(10 Marks)**
   b. Two area 1 and area 2 are interconnected. The capacity of area 1 is 1500MW and area 2 is 500MW. The incremental regulation and damping torque co-efficient for each on its own base are 0.2pu and 0.9pu respectively.
      i) Find the steady state frequency and change in steady-state tie-line power for an increase of 60MW in area 1. The nominal frequency is 50Hz.
      ii) What would be the effect of not having Governor Control? Base MVA = 1500. **(10 Marks)**

6 a. Explain in detail Tie-line oscillations with assumptions made. (12 Marks)
 b. Two generating areas have capacities of 500MW and 1000MW respectively. They are interconnected by a short line. The percentage speed regulation from no-load to full load of the two stations are 3% and 4% respectively. If the load on each station is 250MW. Find the power generation of each station and the tie – line power. (08 Marks)

Module-4

7 a. Explain the different methods of voltage control by reactive power injection. (10 Marks)
 b. Three generating stations are connected to a common bus X as shown in Fig Q7(b). For a particular load, the line voltage at the bus bar falls by 2KV. Calculate the reactive power injection required to bring back the voltage to original valve. All are in pu valves on base of a 500MVA.
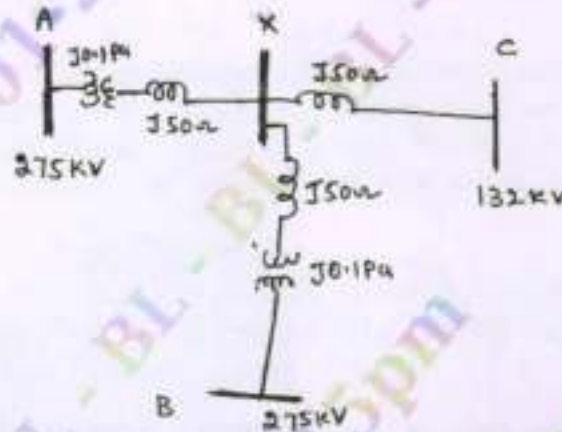
Fig Q7(b) (10 Marks)

8 Write a short note on following :
 a) Absorption to Reactive power
 b) Sensitivity of Voltage
 c) Tap changing transformers
 d) Booster transformers (20 Marks)

Module-5

9 a. Explain the Power system reliability and system security levels. (10 Marks)
 b. Explain 1P1Q method for contingency Ranking. Also explain the contingency processing using AC load flow analysis with a flow chart. (10 Marks)

10 a. Explain the formulation and state estimate using linear square estimation. (10 Marks)
 b. Explain with neat flow chart contingency Analysis for line outage, using outage distribution factors. (10 Marks)

* * * * *

CBCS SCHEME

USN | | | | | | | | | | **18EE824**

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023
Power System Planning

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Explain the principles and process of power system planning. (10 Marks)
  b. Explain different planning tools. (05 Marks)
  c. Write short notes on electricity forecasting. (05 Marks)

OR

2 a. Explain spatial load forecasting and peak load forecast. (10 Marks)
  b. Explain reactive load forecast. (05 Marks)
  c. Write notional and regional planning? Explain. (05 Marks)

Module-2

3 a. What are the broad options available in financial planning? (10 Marks)
  b. Explain minimum revenue requirement used by utilities. (10 Marks)

OR

4 a. Write short notes on renovation and modernization of power plants. (10 Marks)
  b. Write an explanatory note on credit – risk assessment. (05 Marks)
  c. What clean coal technologies? Explain. (05 Marks)

Module-3

5 a. Explain transmission planning criteria and right of way. (07 Marks)
  b. Explain planning in network studies. (05 Marks)
  c. Compare and contrast HVAC and HVDC. (08 Marks)

OR

6 a. What is the planning involved in reactive power? Explain. (10 Marks)
  b. Explain planning in conductors and sub – stations. (10 Marks)

Module-4

7 Explain :
  a. Distribution deregulation
  b. Principles of planning
  c. Urban distribution. (20 Marks)

18EE824
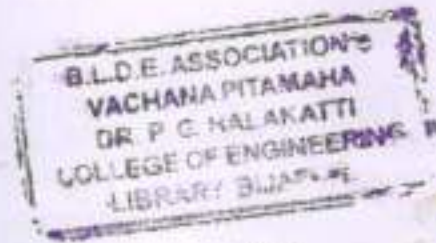
OR

8 Explain the concepts of :
a. Rural electrification
b. Reliability and quality planning
c. Reliability evaluation.   **(20 Marks)**

Module-5

9 a. Explain the term demand response and explain different demand response technologies.
                                                               (10 Marks)
b. What are energy economical products and efficient energy users? Explain.   **(10 Marks)**

OR

10 Write short notes on :
a. Bidding and Trading
b. Differential electricity
c. Smart power market.   **(20 Marks)**

* * * * *

18EE51

USN

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Management and Entrepreneurship

Time: 3 hrs. Max. Marks: 100

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

Module-1

1	a.	Explain briefly the management functions.	(10 Marks)
	b.	Discuss in detail roles of manager.	(10 Marks)

OR

2	a.	Explain the types of decisions.	(10 Marks)
	b.	Explain the steps involved in planning.	(10 Marks)

Module-2

3	a.	Briefly explain principles of organization.	(10 Marks)
	b.	Discuss the importance of staffing.	(04 Marks)
	c.	Explain briefly the functions of staffing.	(06 Marks)

OR

4	a.	Explain briefly the characteristics of motivation.	(06 Marks)
	b.	Write a note on positive and negative motivation.	(06 Marks)
	c.	Explain the steps involved in controlling.	(08 Marks)

Module-3

5	a.	Briefly explain the importance of entrepreneurship.	(10 Marks)
	b.	Give the detailed classification of entrepreneurs.	(10 Marks)

OR

6	a.	Explain the stages in entrepreneurial process.	(10 Marks)
	b.	Discuss the problems faced by entrepreneurs.	(10 Marks)

Module-4

7	a.	Discuss the role of small scale Industry in economic development.	(10 Marks)
	b.	Discuss the problems faced by small scale Industries.	(06 Marks)
	c.	Write a note on impact of Globalization on small scale industries.	(04 Marks)

OR

8	a.	Mention the central agencies that provide support to S.S.I.	(06 Marks)
	b.	Discuss the impact of WTO/GATT on S.S.I.	(09 Marks)
	c.	Mention the reasons for sickness in S.S.I.	(05 Marks)

Module-5

9	a.	Explain briefly the contents of a good project report.	(10 Marks)
	b.	Discuss Market analysis and technical analysis towards project analysis.	(10 Marks)

OR

10	a.	Discuss key point to be considered in selection of project.	(05 Marks)
	b.	Explain the project cycle every project goes through.	(05 Marks)
	c.	Discuss the steps involved in PERT. Also give the advantages.	(10 Marks)

* * * * *

33

15EE52

USN

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Microcontroller

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Distinguish the different types of architecture of microcontroller in regard to construction and instructions with diagrams. **(06 Marks)**

   b. Explain the PSW register with bit pattern. Discuss the function of each flag in detail. **(06 Marks)**

   c. What is stack? Show the position of stack pointer and contents in register after the execution of the following instructions:
   MOV R₀, # 25H
   MOV R₁, # 12H
   PUSH 06
   PUSH 01
   POP 03 **(08 Marks)**

OR

2 a. Describe the functions of various pins of 8051 microcontroller with pin diagram. **(06 Marks)**

   b. Explain the architecture and structure of internal RAM of 8051. **(08 Marks)**

   c. State the addressing modes and explain with examples each of the following instructions:
   i) MOV A, #30H   ii) MOVC A, @A+PC   iii) DA A **(06 Marks)**

Module-2

3 a. Explain the assembler directives in 8051 with examples. **(06 Marks)**

   b. Explain the working of the instruction SUBB when borrow = 0 and borrow = 1. **(06 Marks)**

   c. A student has to take 6 courses in a semester. The marks of the student out of 25 are stored in RAM locations 50H onwards. Write a program to find the average marks and save it in register R₀ in assembly language. **(08 Marks)**

OR

4 a. Explain the different types of conditional and unconditional jump instruction of 8051. Specify the different range associated with jump instruction. **(08 Marks)**

   b. Write an ALP to count the number of ones in a given data. **(06 Marks)**

   c. Explain the following instruction of 8051 with example:
   i)   XCHD, @R1
   ii) SWAP A
   iii) MOVX A, @DPTR **(06 Marks)**

Module-3

5 a. Explain C data types for 8051 with their data size in bits and data range. **(06 Marks)**

   b. Write 8051 C program to send values – 4 to +4 to post P₁. **(06 Marks)**

   c. Explain TMOD and TCON with its bit pattern. **(08 Marks)**

1 of 2

34

OR

6 a. Explain Mode 2 programming of 8051 timer. Describe the different steps to program in Mode 2. (06 Marks)

b. Write an ALP program to create a time delay of 20mse. Assume timer 1, mode 1 and XTAL frequency = 12MHz. (06 Marks)

c. Write an 8051C program to get a byte of data from P_1 wait 1/2 second, and then send it to P_2. (08 Marks)

Module-4

7 a. What is an interrupt? List the various interrupts of 8051 with their corresponding vector address. (06 Marks)

b. Write a ALP to retrieve the data serially and put them in P_1 Set the band rate at 4800, 8 bit data and one stop bit. (06 Marks)

c. Write 8051 C program at 9600 band, 8 bit data, 1 stop bit. (08 Marks)

OR

8 a. Describe the bit status of SCON register. (06 Marks)

b. Write an ALP that continuously gets 8 bit data from P_0 and sends it to P_1 while simultaneously creating a square wave of 200μs on P2.1. Use timer 0, XTAL = 11.0592MHz. (06 Marks)

c. Assume INT1 pin is connected to a switch that is normally high. Whenever it goes low, it should turn on an LED, the LED is connected to P1.3 and is normally off. When it is turned on it should stay on for a fraction of a second. As long as the switch is pressed low, LED should stay on. (08 Marks)

Module-5

9 a. Explain the internal architecture of ADC 0804 and its timing diagram to convert analog data to digital form. (08 Marks)

b. Write an ALP to rotate stepper motor continuously. (06 Marks)

c. Explain the block diagram of 8255 chip. (06 Marks)

OR

10 a. Write a C program to generate a sine wave DAC. (08 Marks)

b. Show interfacing of 8051 microcontroller with DC motor through opto isolator. (06 Marks)

c. Explain various modes of 8255 using control word. (06 Marks)

* * * * *

USN | | | | | | | | | |

18EE53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Power Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. List the different types of power electronic circuits and mention their conversion functions. (10 Marks)
   b. Mention the various characteristics and specifications of switches. (06 Marks)
   c. Explain the peripheral effects in power electronic circuits. (04 Marks)

OR

2 a. Describe reverse recovery characteristics of diode. (08 Marks)
   b. Derive the time constant of RC circuit. (08 Marks)
   c. The forward voltage drop of a power diode is $V_D = 1.2$ V at $I_D = 300$ A, assuming n = 2 and $V_T = 25.7$ mV, find the reverse saturation current I_S. (04 Marks)

Module-2

3 a. Discuss the different operating regions of a power BJT. (06 Marks)
   b. Describe the switching characteristics of power BJT with necessary waveforms during turn-on. (08 Marks)
   c. Explain the steady state characteristics of following devices: (i) MOSFET (ii) IGBT (06 Marks)

OR

4 a. Explain with neat circuit diagrams proportional base control and anti-saturation control. (10 Marks)
   b. Explain the necessity of isolation using pulse transformer and opto-couplers. (10 Marks)

Module-3

5 a. Using two transistor analogy, derive an expression for anode current in a thyristor. (10 Marks)
   b. Distinguish between:
      (i) Latching current and holding current of a thyristor
      (ii) Converter grade and inverter grade thyristors (04 Marks)
   c. Sketch the VI characteristics and then explain latching current, holding current and break over voltage. (06 Marks)

OR

6 a. Explain the need for $\frac{dv}{dt}$ and $\frac{di}{dt}$ protection. (06 Marks)
   b. A SCR circuit has the following data:

   supply voltage = 200 V, $\frac{dv}{dt}$ rating = 100 $\frac{v}{\mu s}$, $\frac{di}{dt}$ rating = 50 $\frac{A}{\mu s}$,

   calculate the snubber circuit elements. (06 Marks)
   c. With a neat circuit diagram and waveforms, explain the RC triggering for SCR. (08 Marks)

Module-4

7 a. With neat circuit and waveforms, derive an expression for the rms value of output voltage of 1-φ full wave controlled rectifier with R load. (08 Marks)

b. For the 1-φ full converter having inductive load and continuous load current, obtain:
   (i) Average output voltage   (ii) rms output voltage (06 Marks)

c. Describe the working of 1-φ dual converter and draw the waveforms. (06 Marks)

OR

8 a. Derive an expression for the rms value of the output voltage of a bi-directional AC voltage controller employing ON-OFF control. (10 Marks)

b. With necessary waveforms, derive the expression for rms output voltage of a 1-φ full wave controller with inductive load for discontinuous load current. (10 Marks)

Module-5

9 a. Explain the principle of operation of a step-up chopper. (06 Marks)

b. Classify the different types of chopper circuits. (04 Marks)

c. With the help of circuit and quadrant diagrams, explain the working of a class E chopper. (10 Marks)

OR

10 a. Explain the operation of single phase full bridge inverter with R load and draw the waveforms. (08 Marks)

b. Explain sinusoidal PWM technique used for controlling the output voltage of an inverter. (06 Marks)

c. Write a note on performance parameters for inverters. (06 Marks)

* * * * *

37

CBCS SCHEME

USN | | | | | | | | | | | **18EE54**

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Signals and Systems

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Describe the classifications of signals.   (06 Marks)
   b. Is the signal shown in Fig.Q1(b) in power or energy signal? Given reasons for your answer and further determine its energy or power.

Fig.Q1(b)   (06 Marks)
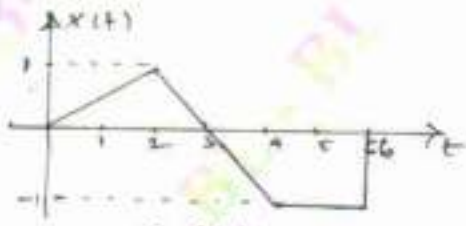
   c. Determine whether the following signal are periodic, if periodic determine the fundamental period :
       i) $x(t) = \cos 2t + \sin 3t$
       ii) $x(n) = \cos(\frac{1}{5}\pi n)\sin(\frac{1}{3}\pi n)$.   (08 Marks)

OR

2 a. Sketch the following signals and determine their even and odd signals
       $r(t+2) - r(t+1) - r(t-2) + r(t-3)$.   (08 Marks)
   b. Given signal x(t) as shown in Fig.Q2(b). Sketch the following : i) $x(-2t+3)$ ii) $x(t/2-2)$.
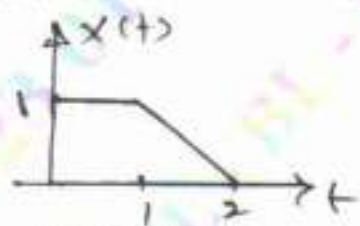
Fig.Q2(b)   (06 Marks)

   c. For each of the system, state whether the system is linear, shift variant, stable, causal and memory.   i) $y(n) = \log[x(n)]$ ii) $y(t) = x(t^2)$.   (06 Marks)

Module-2

3 a. Compute the convolution of two sequences $x_1(n)$ and $x_2(n)$ given below :

       $x_1(n) = \{1, 2, 3\}$ $x_2(n) = \{1, 2, 3, 4\}$.   (06 Marks)

   b. Convolute the following two signals
       $x(t) = 1$; $0 < t < T$ $h(t) = t$; $0 < t < 2T$
            0 ; otherwise 0 ; otherwise
       Obtain expression for the output y(t).   (08 Marks)

   c. An LTI system represented by the impulse response :

       i) $h(t) = e^{t^2} u(t-1)$ ii) $h(n) = a^n u(n+2)$

       Determine whether its stable, causal and memory.   (06 Marks)

1 of 3

38

OR

4 a. Find the forced response for the system described by

$$\frac{d^2y(t)}{dt^2} + \frac{5dy(t)}{dt} + 6y(t) = 2x(t) + \frac{dx(t)}{dt}$$

with input $x(t) = 2e^{-t} u(t)$. (08 Marks)

b. Find the natural response of the system described by difference equation :

$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1)$ with $y(-1) = 0$ and $y(-2) = 1$. (06 Marks)

c. Draw the direct form I and II realization for the following system :

$$2\frac{d^3y(t)}{dt^3} + \frac{dy(t)}{dt} + 3y(t) = x(t).$$ (06 Marks)

Module-3

5 a. What are the properties of continuous time Fourier transform and prove Parsavel's theorem. (08 Marks)

b. Obtain the Fourier transform of the signal :

i) $x(t) = e^{-at} u(t)$

ii) $x(t) = e^{-at}$ (06 Marks)

c. Using convolution theorem, find the inverse Fourier transform of

$$X(\omega) = \frac{1}{(a + j\omega)^2}.$$ (06 Marks)

OR

6 a. Using partial fraction expansion, determine the inverse Fortier transform

$$X(j\omega) = \frac{5j\omega + 12}{(j\omega)^2 + (5j\omega) + 6}$$ (06 Marks)

b. Find the Fourier transform of the following signal using appropriate properties.

$x(t) = \sin(\pi t)e^{-2t} u(t).$ (06 Marks)

c. Consider the continuous time LTI system described by

$$\frac{dy(t)}{dt} + 2y(t) = x(t).$$

Using Fourier transform, find the output $y(t)$ with input signal $x(t) = e^{-t}u(t)$. (08 Marks)

Module-4

7 a. Describe the following properties of DTFT
   i) Frequency differentiation
   ii) Scaling
   iii) Modulation. (06 Marks)

b. Find the DTFT of the following signals :

   i) $x(n) = (0.5)^{n+2}u(n)$

   ii) $x(n) = n(0.5)^n u(n).$ (06 Marks)

c. Find the inverse DTFT

$$X(\Omega) = \frac{3 - \frac{5}{4}e^{-j\Omega}}{\frac{1}{8}e^{-j2\Omega} - \frac{3}{4}e^{-j\Omega} + 1}$$ (08 Marks)

OR

8 a. Find the frequency response and the impulse response of discrete time system described by difference equation :

$$y(n-2) + 5y(n-1) + 6y(n) = 8x(n-1) + 18x(n)$$ (10 Marks)

   b. Determine the difference equation for the system with following impulse response

$$h(n) = \delta(n) + 2(\tfrac{1}{2})^n u(n) + [-\tfrac{1}{2}]^n u(n).$$ (10 Marks)

Module-5

9 a. Explain the properties of ROC.   (06 Marks)

   b. For the signal $x(n) = 7(\tfrac{1}{3})^n - 6(\tfrac{1}{2})^n u(n)$, find the Z – transform and ROC.   (06 Marks)

   c. By using suitable properties of Z – transform find the Z – transform and ROC of the following :

   i) $x(n) = (\tfrac{1}{2})^n u(n) - 3^n u(-n-1)$

   ii) $x(n) = n\, a^n u(n-3).$ (08 Marks)

OR

10 a. Find the inverse Z – transform of the sequence $x(z) = \dfrac{z}{3z^2 - 4z + 1}$, for the following :

   i) $|z| > 1$ ii) $|z| < \tfrac{1}{3}$ iii) $\tfrac{1}{3} < |z| < 1.$ (06 Marks)

   b. Solve the following linear constant co-efficient difference equation using unilateral Z – transform method.

$$y(n) = \tfrac{3}{2}y(n-1) + \tfrac{1}{2}y(n-2) = (\tfrac{1}{4})^n u(n), \text{ with I.C. } y(-1) = 4, y(-2) = 10.$$ (08 Marks)

   c. A system has impulse response $h(n) = (\tfrac{1}{2})^n u(n)$. Determine the input to the system if the output is given by $y(n) = \tfrac{1}{3}u(n) + \tfrac{2}{3}(-\tfrac{1}{2})^n u(n).$ (06 Marks)

* * * * *

CBCS SCHEME

USN ☐☐☐☐☐☐☐☐

Fifth Semester B.E Degree Examination, Jan./Feb. 2023
Environmental Studies
(COMMON TO ALL BRANCHES)

[Max. Marks: 100

Time: 2 hrs.]

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **hundred** questions, each question carries one mark.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

---

1. The Karnataka State Pollution Control Board (KSPCB) was established in the year.
   a) 1974   b) 1982   c) 1973   d) 1983

2. Which of the following is not a part of the hydrological cycle?
   a) Precipitation   b) Infiltration
   c) Transpiration   d) Perspiration

3. First International Earth Summit was hold at
   a) USA   b) Russia
   c) Rio-de-Janerio   d) Johannesburg

4. Which among the following has highest percentage of calorific value?
   a) Anthracite   b) Peat
   c) Lignite   d) Bituminous coal

5. Nitrogen fixing bacteria exists in
   a) Leaf   b) Stem
   c) Roots   d) Flower

6. The two major components of ecosystem are
   a) Adiabatic and isotropic   b) Ecologic and climatologic
   c) Cyclic and biologic   d) Abiotic and biotic

7. Geothermal energy is a
   a) Heat energy   b) Wind energy
   c) Current energy   d) Solar energy

8. The average life expectancy around the world is currently.
a) Decreasing
b) Increasing
c) Stabilizing
d) Not changing

9. The universal declaration of Human Rights was proclaimed by the UN in the year.
a) 1946
b) 1947
c) 1948
d) 1949

10. The objective of Integrated Child Development Service (ICDS) are
a) Immunization
b) Health check up and referral services
c) Pre-school non formal education
d) All of these

11. GIS stands for
a) Geostationary Interact Sector
b) Geographical Information System
c) Geotechnical Information Society
d) Geothermal Investigation Site

12. LPG is a mixture of
a) N_2 and H_2S
b) CO_2 and N_2
c) Propane and butanes
d) Methane and CO_2

13. The Tiger Conservation Project was started in
a) 1973
b) 1975
c) 1981
d) 2000

14. The leader of "Chipko Movement" is
a) Sunderlal Bahuguna
b) Medha Patkar
c) Vandana Shiva
d) Mahatma Gandhi

15. Which of the following is the source of Fly-ash?
a) Vehicular exhaust
b) Sewage
c) Thermal power plant
d) All of these

16. The permissible range of pH for drinking water as per the Indian Standard is
a) 6 to 9
b) 6.5 to 8.5
c) 6 to 8.5
d) 6.5 to 7.5

17. Water logging is a phenomena in which
a) Water patterns are rotated
b) Soil root zone becomes saturated due to over irrigation
c) Erosion of soil
d) Soil degradation

18. Carbon content is higher in
a) Living matter
b) Soil
c) Water
d) Atmosphere

19. Springs means
a) Surface water
b) Atmosphere water
c) Both (a) and (b)
d) Ground water

20. Bio-remediation means deliberately introducing micro organisms to break pollutants.
a) Soil
b) Waste water
c) Ground water
d) Both soil and groundwater

42

21. In geosynchronous orbit altitude of the satellite is about
    a) 36,000 kms   b) 10,000 kms
    c) 50,000 kms   d) None of these

22. The Air (Prevention and Control of Pollution) Act was enacted in the year.
    a) 1987   b) 1981   c) 1991   d) 1988

23. Kudremukh Iron are mine. Karnataka was closed due to
    a) River pollution and threat to biodiversity
    b) Land encroachment
    c) Radioactive hazards
    d) Serious health hazard

24. On the eve of Gandhi Jayanthi which andolan was launched by our Honorable Prime
    Minister
    a) Swedeshi   b) Sarvashikshana Abhiyana
    c) Suvarnagrama   d) Swach Bharath

25. An international agreement signed in the year 1987, to protect stratospheric ozone is
    known as
    a) Montreal protocol   b) Kyoto protocol
    c) Earth summit   d) None of these

26. The explosion of First Atomic Bomb was done in Hiroshima and Nagasaki in
    a) 1946   b) 1986   c) 1945   d) 1947

27. A dangerous pesticide which has been reported to cause physical deformities to people of
    Kerala and Karnataka states
    a) Endosulfan   b) Fluorides   c) DDT   d) Dioxygene

28. Visible portion of EMR ranges between
    a) $0.4 - 0.76 \mu m$ b) $10.5 - 12.5 \mu m$ c) $8.0 - 14.0 \mu m$ d) None of these

29. Data representation in Raster data is by
    a) pixel   b) points, lines and polygon
    c) latitude and longitude   d) none of these

30. In water treatment. alum is used for
    a) softening   b) coagulation   c) filtration   d) disinfection

31. Among the fresh water available in the earth the percentage of surface water is about
    a) 50%   b) 10%
    c) 5%   d) less than 1%

32. Hepatitis is caused by
    a) Protozoa   b) Virus
    c) Bacteria   d) Fungus

33. In India groundwater resources are rich in
    a) Plains of river Kaveri and Krishna   b) The Deccan plateau
    c) The Gangetic plains   d) The plains of Netravati and Kapila

34. The required iron content in drinking water as specified by BIS is
    a) 300 mg/l   b) 30 mg/l   c) 3 mg/l   d) 0.30 mg/l

43

35. Molasses from sugar industry is used to generate
    a) Biodiesel
    b) Hydrogen
    c) Bioethanol
    d) Biomethanol

36. Wind Farms are located in
    a) River basin
    b) Plain area
    c) Hilly area
    d) Valley area

37. Biomass consists of
    a) Lignin
    b) Hemi cellulose
    c) Cellulose
    d) All of these

38. Natural gas contains
    a) Carbon dioxide
    b) Hydrogen
    c) Methane
    d) Nitrogen

39. Anti tobacco day is mentioned on
    a) 31st May
    b) 30th June
    c) 31st July
    d) 31st August

40. Population explosion will cause
    a) Socio-Economic Problems
    b) Food Scarcity
    c) Energy crises
    d) All of these

41. Which of the following element make e-waste hazardous in nature?
    a) Land
    b) Glass
    c) Plastic
    d) Iron

42. What is the hazardous pollutant released from batteries?
    a) Arsenic
    b) Barium
    c) Cobalt
    d) Cadmium

43. What is the term used for reuse of sewage sludge?
    a) Compost
    b) Solids
    c) Biosolids
    d) Sludge

44. Reduction in brightness of the famous Taj Mahal is due to
    a) Global warming
    b) Air pollution
    c) Ozone depletion
    d) Afforestion

45. E.I.A. can be expanded as
    a) Environment and Industrial Act
    b) Environment of Impact Activities
    c) Environmental Impact Assessment
    d) Environmentally Important Activity

46. Organic Farming is
    a) Farming without using pesticides and chemical fertilizer
    b) Enhances biodiversity
    c) Promotes soil biological activity
    d) All of these

47. Bio-remediation means the removal of contaminants from
    a) Soil
    b) Wastewater
    c) Groundwater
    d) Both soil and ground water

18CIV59

48. Plants use _____ gas for photosynthesis.
   a) Oxygen   b) Methane
   c) Nitrogen   d) Carbon dioxide

49. What is the maximum allowable concentration of fluorides in drinking water?
   a) 1.0 mg/l   b) 1.25 mg/l
   c) 1.50 mg/l   d) 1.75 mg/l

50. Forest rich area in Karnataka is found in _____.
   a) Western Ghats   b) Bandipur
   c) Nagarhole   d) Mangalore

51. "Minamata Disease" is caused due to
   a) Lead   b) Arsenic   c) Mercury   d) Cadmium

52. Alternative eco-friendly fuel for automobiles is
   a) Petrol   b) Diesel   c) CNG   d) Kerosene

53. Population explosion will cause
   a) Biodiversity   b) Stress on ecosystem
   c) More employment   d) None of these

54. Which of the following is having high population density?
   a) India   b) China   c) USA   d) Western Europe

55. Demography is the study of
   a) Animals behaviour   b) Population growth
   c) River   d) None of these

56. Forest are called as _____.
   a) Air purifier   b) Earth's lungs   c) Oxygen reservoir   d) CO_2 absorbers

57. Which of the following is the facility that the urban people enjoy?
   a) Better quality of air   b) Better communication access
   c) Large land at cheap rates   d) None of these

58. Which of the following is an air pollutant?
   a) Carbon dioxide   b) Oxygen
   c) Nitrogen   d) Particulate matter

59. Cyoto toxic and expired drugs are disposed of by
   a) damping   b) autoclave
   c) incineration   d) chemical disinfection

60. The colour code of plastic bag for disposing of microbial laboratory culture waste.
   a) Black   b) Red
   c) Blue   d) White

61. South Africa is loading exporter of which mineral?
   a) Copper   b) Diamond
   c) Silver   d) Gold

62. The word 'sustainable development' came into existence in the year.
 a) 1992   b) 1978   c) 1980   d) 1987

63. The other word of landscaping is
 a) Reduction   b) Restoration
 c) Removing topsoil   d) Restore

64. Cloud seeding with silver iodide is based on the
 a) Bergeron process   b) Collision-coalescence process
 c) Both a and b   d) None of these

65. Environmental pollution is due to
 a) Rapid urbanization   b) Deforestation
 c) Afforestation   d) a and b

66. The liquid waste from bathroom and kitchen is called
 a) Sullage   b) Domestic sewage
 c) Storm water   d) Runoff

67. BOD means
 a) Biochemical Oxygen Demand   b) Chemical oxygen demand
 c) Biophysical Oxygen Demand   d) All of these

68. Which of the following source is surface water?
 a) Springs   b) Streams
 c) Deep wells   d) All of these

69. Which of the following is biodegradable?
 a) Plastics   b) Domestic sewage
 c) Detergents   d) a and c

70. Blaring sounds known to cause
 a) Mental distress   b) High cholesterol
 c) Neurological problems   d) All of these

71. Eutrophication is
 a) an improved quality of water in lakes
 b) a process in carbon cycle
 c) the result to accumulation of plant nutrients in water bodies
 d) a water purification technique

72. Primary consumer is
 a) Herbivores   b) Carnivores
 c) Macro consumers   d) Omnivores

73. Which among the following is a climatic factor?
 a) pressure   b) humidity
 c) temperature   d) all of these

74. Biodiversity can be broadly classified into how many types?
 a) 2   b) 5   c) 3   d) 4

75. Hot spot areas have
a) Low density of biodiversity
b) Only endangered plants
c) High density of hot springs
d) High density of biodiversity

76. About _____ % of the earth's surface is covered by water.
a) 53%
b) 19%
c) 71%
d) 90%

77. Deforestation means
a) preservation of forests
b) destruction of forests
c) monocrop cultivation
d) agriculture

78. When did National Disaster Management Authority formed?
a) 2000
b) 2005
c) 2010
d) 2015

79. Disaster is an event arising out of
a) result of hazard event
b) causes of hazard event
c) causes of disaster event
d) all of these

80. The scientific study of earthquake is called
a) seismograph
b) seismology
c) both a and b
d) none of these

81. World Environmental day is held every year on
a) June 5th
b) October 2nd
c) April 22nd
d) November 1st

82. Ozone layer thickness is measured in _____.
a) mm
b) cm
c) Dobson unit
d) Db

83. First of the major environmental protection acts to be promulgated in India was
a) The Water Act
b) The Air Act
c) The Environment Act
d) Noise Pollution Rules

84. Blue baby syndrome is causes due to _____
a) Manganese
b) Ozone
c) Silver
d) Nitrate

85. World Earth's day is annually celebrated on
a) April 22nd
b) June 5th
c) January 1st
d) May 1st

86. The most important fuel used by nuclear power plant is
a) U-235
b) U-238
c) U-245
d) U-248

87. Which of the following is a biotic component of ecosystem?
a) Fungi
b) Solar light
c) Temperature
d) Humidity

88. Abiotic component includes
a) Soil
b) Temperature
c) Water
d) All of these

89. The word "Environment" is derived from
a) Greek
b) French
c) Spanish
d) English

90. Which of the following is absorbed by green plants from the atmosphere?
   a) Carbon dioxide
   b) Water
   c) Nutrients
   d) All of these

91. Which of the following is a possible producer in an ecosystem?
   a) Animal
   b) Plants
   c) Human beings
   d) Fish

92. The largest reservoir of nitrogen in our planet is
   a) Oceans
   b) Biosphere
   c) Atmosphere
   d) Rivers

93. India has the world's largest share of which of the following
   a) Manganese
   b) Mica
   c) Copper
   d) Diamond

94. Identify the non renewable source of energy from the following:
   a) Coal
   b) Fuel cells
   c) Wind power
   d) Wave power

95. Which of the following terminologies is not associated with the vertical structure of forest?
   a) Canopy
   b) Understory
   c) Forest floor
   d) First floor

96. Which of the following is cause of class of biodiversity?
   a) Habitat degradation
   b) Invasion of non-native species
   c) Pollution
   d) All of these

97. Air pollution from automobiles can be controlled by fitting
   a) Electrostatic precipitator
   b) Cyclone separator
   c) Wet collector
   d) Catalytic converter

98. When the solid waste consists of large amount of organic matter and if the moisture content is high, which of the following methods of treatment will be ideal?
   a) Composting
   b) Palletizing
   c) Incineration
   d) Recycling

99. Chernobyl Nuclear Disaster occurred in the year
   a) 1984
   b) 1985
   c) 1986
   d) 1987

100. The primary cause of acid rain around the world is
   a) Carbon dioxide
   b) Sulphur dioxide
   c) Carbon monoxide
   d) Ozone

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐   18EE55

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Electrical Machine Design

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Mention the desirable properties of electrical insulating materials. Also give the classification of insulating materials based on temperature with an example for each.
(10 Marks)
   b. What are the limitations in the design of electrical machines? (05 Marks)
   c. List out the desirable properties of conducting materials. (05 Marks)

OR

2 a. What are the advantages of modern trends in design and manufacturing technique?(08 Marks)
   b. What are good properties of magnetic materials? (06 Marks)
   c. What is cold rolled grain oriented Silicon Steel? What are advantages of using these materials in electrical machines? (06 Marks)

Module-2

3 a. Discuss the effect of higher values of magnetic and electric loading in DC machines.
(10 Marks)
   b. Explain the guiding factors for choice of number of armature slots in d.c. machines.
(10 Marks)

OR

4 a. Discuss the various factor which govern the choice of number of pole in DC machine. What are the advantages and disadvantages of large number of poles in DC machines? (10 Marks)
   b. Find the main dimensions and number of poles of a 37 KW, 230 V, 1400 rpm shunt motor so that a square pole face is obtained. The average gap density is 0.5 T an ampere conductor/m is 22000. The ratio of pole arc to pole pitch is 0.7 and full load efficiency is 90%. (10 Marks)

Module-3

5 a. Derive the output equation of 3 phase core type transformer. Also derive the volt per turn equation. (10 Marks)
   b. Calculate approximate overall dimensions for a 200 KVA, 6600/440 V, 50 Hz, 3 φ core type transformer. The following data are: Emf/turn = 10 V, maximum flux density = 1.3 Wb/m², current density = 2.5 A/mm², window space factor = 0.3, overall height = overall width, stacking factor = 0.9. Use 3-stepped core, width of largest stapping = 0.9 d, net iron area = 0.6 d² where 'd' is diameter of circumscribing circle. (10 Marks)

OR

6 a. Derive an expression for leakage reactance of a transformer with primary and secondary cylindrical coil of equal length, stating clearly all the assumptions made. (10 Marks)

1 of 2

49

b. The tank of 250 KVA, natural oil cooled transformer has the dimension length, width and height as $0.65 \times 1.55 \times 1.85$ respectively. The full load loss is 13.1 KW, loss of dissipation due to radiation is 6 W/m²-°C, loss dissipation due to convection is 6.5 W/m²-°C, improvement in convection due to provision of tubes is 40%, temperature rise is 40°C, length of each tube = 1 m, diameter of tube is 50 mm. Find the number of tubes for this transformer. Neglect the top and bottom surface of the tank as regards the cooling.

(10 Marks)

Module-4

7 a. What are factors to be considered for estimating the length of air gap for induction motors?

(10 Marks)

b. Determine the main dimensions of a 70 HP, 415 V, 3-φ, 50 Hz, star connected, 6 pole induction motor for which ampere conductor/m = 30000 and B_{av} = 0.51 T. Take efficiency = 90% and power factor = 0.91. Assume pole pitch, τ = L. Estimate the number of stator conductors required for winding in which the conductors are connected in 2-parallel paths. Choose suitable number of conductors/slot, so that slot loading does not exceed 750 ampere conductors.

(10 Marks)

OR

8 a. Explain the step by step procedure to design end rings.   (08 Marks)

b. Find the magnetizing current, no load current, no load power factor of 15 HP, 440 V, 6 pole, delta connected slip ring inductor motor having following data:
Number of stator slots = 54, conductors/slot = 28, flux/pole = 8.25 mWb, gap area/pole = 183.5 cm², gap length = 0.55 mm, iron losses = 510 MW, friction and windage losses = 110 W, gap expansion coefficient = 1.33, iron parts of magnetic circuit requires 20% of ATS required for the gap K_{w1} = 0.96.

(12 Marks)

Module-5

9 a. Discuss the effect of SCR on the performance of synchronous machines.   (06 Marks)

b. Explain the factors affecting choice of specific electric and magnetic loading.   (08 Marks)

c. A 500 KVA, 33 KV, 50 Hz, 600 rpm, 3 φ salient pole alternator has 180 turns/ph. Estimate length of air gap, if average flux density is 0.54 T. The ratio pole arc to pole pitch is 0.66, the short circuit ratio is 1.2, gap construction factor is 1.15 and K_w = 0.955. The mmf required for air gap is 80% of no field mmf.

(06 Marks)

OR

10 a. Explain the design procedure involved in the design of field winding of a salient pole alternator.

(06 Marks)

b. Derive the output equation of synchronous machine and show that

$$HP = \frac{\text{input KVA} \times \eta \times \cos\phi}{0.746}$$

(08 Marks)

c. Estimate diameter, core length and number of conductors for a 15 MVA, 11 KV, 50 Hz, 2 pole, star connected turbo alternator with phase spread 60°. Assume B_{av} = 0.55 T, ac = 36000 A/m, δ = 5 A/mm², V_a = 160 m/s. The winding designed to eliminate 5th harmonic.

(06 Marks)

* * * * *

CBCS SCHEME

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023

High Voltage Engineering

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any missing data suitably.

Module-1

1. a. Derive an expression for the current growth in the air gap considering Townsend first ionization coefficient. **(08 Marks)**
   b. What is Paschen's law? How do you account for the minimum voltage for breakdown under a given PXD condition? **(08 Marks)**
   c. List the three important properties of liquid dielectrics. **(04 Marks)**

OR

2. a. List the various breakdown mechanisms in solid dielectrics and explain thermal breakdown. **(08 Marks)**
   b. Explain briefly suspended particle theory of breakdown in liquid dielectric. **(06 Marks)**
   c. What is meant by time lag of breakdown? Explain statistical and formative time lag. **(06 Marks)**

Module-2

3. a. Explain the working of Cockcroft – Walton type voltage multiplier circuit with schematic diagram. **(06 Marks)**
   b. Describe with a neat sketch, the working of a Vande Graaff generator. **(06 Marks)**
   c. With a circuit diagram, explain the tripping of an impulse generation with three electrode gap arrangement. **(08 Marks)**

OR

4. a. What are the advantages of high frequency transformers? Explain the 3-stage cascaded transformer for generation of HVAC. **(10 Marks)**
   b. Explain with schematic diagram the Marx circuit of multistage impulse generator incorporating the series and wave tail resistances within the generator. **(06 Marks)**
   c. A 12-stage impulse generator has 0.126 µF capacitors. The wave-front and wave-tail resistances connected are 800 ohms and 5000 ohms respectively. If the load capacitor is 1000 PF, find the front and tail times of the impulse wave produced. **(04 Marks)**

Module-3

5. a. Explain the various factors that affect the spark over voltage of sphere gap. **(08 Marks)**
   b. With a block diagram, explain the cathode ray oscilloscope for impulse measurement. **(08 Marks)**
   c. A generating voltmeter has to be designed so that it can have a range from 20 to 200 KV DC. If the indicating meter reads a minimum current of 2 µA and maximum current of 25 µA, what should the capacitance of the generating voltmeter be? **(04 Marks)**

51

OR

6   a.   With a schematic diagram, explain the principle of operation of a generating voltmeter.
(08 Marks)

   b.   With a neat sketch, explain the working of Rogowiski coil for high impulse current measurement.
(06 Marks)

   c.   Explain how peak value of high voltage AC is measured using Chubb-Frotscue method.
(06 Marks)

Module-4

7   a.   Write the classification of transmission lines and explain any one.
(06 Marks)

   b.   Explain the successive reflections and lattice diagrams.
(06 Marks)

   c.   What is direct and indirect lightning stroke? Give reasons for induced voltage on the power line due to indirect stroke.
(08 Marks)

OR

8   a.   List the parameters to be considered for the selection of surge arrester voltage rating for EHV and UHV. Also explain the types of surge arresters used.
(10 Marks)

   b.   Explain with suitable figures the principle and functioning of
(i) Expulsion Gaps   (ii) Protector tubes.
(10 Marks)

Module-5

9   a.   With a necessary circuit diagram and pattern explain discharge detection using straight detector for partial discharge measurement.
(10 Marks)

   b.   Explain the method of measuring dielectric loss at power frequency using high voltage Schering bridge.
(10 Marks)

OR

10   a.   Explain the different methods of conducting short circuit tests on circuit breakers. (10 Marks)

   b.   Explain the power frequency tests and impulse tests for
(i) Insulators   (ii) Bushings.
(10 Marks)

* * * * *

52