Subject: - Utilization of Electrical Energy(22626)

SYLLABUS

Chapter No.	Name of chapter	Marks With Option
1	Illumination	12
2	Electric Heating and Welding	26
3	Electric Drives & Elevators	26
4	Electric Traction	26
5	Tariff and Power Factor Improvement	12
	Total Marks: -	**104**

BOARD THEORY PAPER PATTERN FOR UEE (22626)

Q.1		**Attempt any FIVE** **5*2=10**
	a)	Illumination
	b)	Illumination
	c)	Electric Heating and Welding
	d)	Electric Drives & Elevators
	e)	Electric Traction
	f)	Tariff and Power Factor Improvement
	g)	Tariff and Power Factor Improvement
Q.2		**Attempt any THREE** **3*4=12**
	a)	Illumination
	b)	Electric Heating and Welding
	c)	Electric Drives & Elevators
	d)	Electric Traction

Q.3		**Attempt any THREE** **3*4=12**
	a)	Illumination
	b)	Electric Heating and Welding
	c)	Electric Drives & Elevators
	d)	Tariff and Power Factor Improvement
Q.4		**Attempt any THREE** **3*4=12**
	a)	Electric Heating and Welding
	b)	Electric Drives & Elevators
	c)	Electric Traction
	d)	Electric Traction
	e)	Tariff and Power Factor Improvement
Q.5		**Attempt any TWO** **2*6=12**
	a)	Electric Heating and Welding
	b)	Electric Drives & Elevators
	c)	Electric Traction
Q.6		**Attempt any TWO** **2*6=12**
	a)	Electric Heating and Welding
	b)	Electric Drives & Elevators
	c)	Electric Traction

CLASS TEST - I

PAPER PATTERN

COURSE: - Utilization of electrical energy (22626)

PROGRAMME: - Electrical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
1	**Illumination**	**CO-626.01**
2	**Electric Heating and Welding**	**CO-626.02**
3	**Electric Drives & Elevators**	**CO-626.03**

Q.1	**Attempt any FOUR** 4*2=8Marks	Course Outcome (CO)
a)	Illumination	CO-626.01
b)	Illumination	CO-626.01
c)	Electric Heating and Welding	CO-626.02
d)	Electric Heating and Welding	CO-626.02
e)	Electric Drives & Elevators	CO-626.03
f)	Electric Drives & Elevators	CO-626.03
Q.2	**Attempt any THREE 3*4=12 Marks**	
a)	Illumination	CO-626.01
b)	Electric Heating and Welding	CO-626.02
c)	Electric Heating and Welding	CO-626.02
d)	Electric Heating and Welding	CO-626.02
e)	Electric Drives & Elevators	CO-626.03

CLASS TEST - II

PAPER PATTERN

COURSE: - Utilization of electrical energy (22626)

PROGRAMME: - Electrical Engineering

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
4	Electric Traction	**CO-626.04**
5	Tariff and Power Factor Improvement	**CO-626.05**

Q.1	**Attempt any FOUR** **4*2=8Marks**	Course Outcome (CO)
a)	Electric Traction	CO-626.04
b)	Electric Traction	CO-626.04
c)	Electric Traction	CO-626.04
d)	Electric Traction	CO-626.04
e)	Tariff and Power Factor Improvement	CO-626.05
f)	Electric Traction	CO-626.04
Q.2	**Attempt any THREE** **3*4=12 Marks**	
a)	Electric Traction	CO-626.04
b)	Electric Traction	CO-626.04
c)	Electric Traction	CO-626.04
d)	Electric Traction	CO-626.04
e)	Tariff and Power Factor Improvement	CO-626.05

COURSE OUTCOME (CO)

COURSE: - Utilization of electrical energy (22626)

PROGRAMME: - Electrical Engineering

CO. NO.	Course Outcome
CO- 626.01	Maintain the functioning of different types of lamps and fitting.
CO- 626.02	Maintained different electric heating and welding equipment.
CO- 626.03	Maintained different electric drive and elevator
CO- 626.04	Use different electric traction system
CO- 626.05	Used equipment for economic Operation

1. Illumination

Position in Question Paper **Total Marks-8**

Q.1. a) 2-Marks.
Q.1. b) 2-Marks.
Q.3. a) 4-Marks.

Descriptive Question

1. Define the following :i)solid angle ii)candela iii)Luminous efficiency iv) M.S.C.P
2. Define the terms: i)Illumination ii) Glare iii)Luminance iv) Luminous efficiency
3. Explain why it is economical to use few large sources of light mounted high for industrial use than many sources of low output.
4. What are drawbacks of direct lighting systems and how these are over come?
5. Define: i)Space to height ratio ii)Specific output iii)Coefficient of utilization iv)coefficient of reflection
6. State the laws of illumination. Explain the laws with the help of suitable diagrams, and derive an equation of the same.
7. Explain with a neat diagram the principle of operation of a sodium vapour lamp. Mention its applications.
8. With a neat diagram, explain the construction and working of Mercury vapour lamp.
9. State and describe various types of lighting schemes
10. Discuss the flood lighting with suitable
11. Compare a tungsten filament lamp with fluorescent lamp in deatail
12. With a neat diagram, explain the construction ,working of Sodium vapour lamp

MCQ Question

(Total number of Question=Marks*3=8*3=24)

Note: Correct answer is marked with **bold.**

1. Radiant efficiency of the luminous source depends on
   a) shape of the source
   b) wavelength of light rays
   c) temperature of the source
   d) All of the above.
2. Light waves travel with a velocity of
   a) 3 x 1010cm/s
   b) 3 x 1012cm/s
   c) 3 x 1015 cm/s
   d) 3 x 1018 cm/s
3. Carbon arc lamps are commonly used in
   a) domestic lighting
   b) street lighting
   c) cinema projectors
   d) photography
4. The unit of solid angle is
   a) solid angle
   b) radian
   c) Steradian
   d) candela
5. Candela is the unit of
   a) Luminous flux
   b) Luminous intensity
   c) Wavelength
   d) None of the above.
6. The illumination is directly proportional to the cosine of the angle made by the normal to the illuminated surface with the direction of the incident flux. Above statement is associated with
   a) Planck's law
   b) Macbeth's law of illumination
   c) Bunsen's law of illumination
   d) Lambert's cosine law
7. The Illumination level required for precision work is around
   a) 50 lm/m^2
   b) 100 lm/m^2
   c) 200lm/m^2
   d) 500 lm/m^2
8. Which of the following will need the highest level of illumination ?
   a) Proof reading
   b) Bed rooms
   c) Hospital wards
   d) Railway platforms
9. Which of the following will need lowest level of illumination ?
   a) Displays
   b) Fine engraving
   c) Railway platform
   d) Auditoriums.

10.Which of the following lamp gives nearly monochromatic light ?
a) Sodium vapor lamp
c) Tube light
b) GLS lamp
d) Mercury vapor lamp

11.Enhance lighting is used for decoration and effective visualization of
a) Gold
c) Diamond
b) Silver
d) All of the above

12. Lamp Efficiency of LED?
a) High (more than 60 lumen per watt)
b) High (more than 70 lumen per watt)
c) High (more than 80 lumen per watt)
d) High (more than 90 lumen per watt)

13.types of Electronic dimmer?
a) S.C.R. operated dimmer
c) **Both (a) & (b)**
b) Triac operated dimmer
d) None of the above

14.Lamp Efficiency of LED?
a) High (more than 60 lumen per watt)
b) High (more than 70 lumen per watt)
c) High (more than 80 lumen per watt)
d) High (more than 90 lumen per watt)

15. State the Lux level recommended for Classroom
a) 100 lux
c) 250 lux
b) 150 lux
d) **300 lux**

16. State the Lux level recommended for College Auditorium
a) 500 lux
c) 700 lux
b) 600 lux
d) 800 lux

17.State the Lux level recommended for Outdoor area/parking area
a) 500 to 1000 lux
c) 1000 to 2000 lux
b) 1500 to 2500 lux
d) 1000 to 1500 lux

18. State the Lux level recommended for Research and development center
a) 200 to 300 lux
c) 400 to 500 lux
b) 300 to 400 lux
d) **500 to 600 lux**

19. State type of lamps used in Horticulture?
a) High pressure sodium lamps
b) Metal halide lamps
c) Any of the standard high pressure lamp of 250W, 500W, 1000W

d) All of the above Answer

20. State the selection criterion of the lamp for various purposes?
   a) Rated service life
   b) Surface brightness
   c) Compatibility with the electrical system
   d) **All of the above**

21. State any four design considerations for illumination scheme of commercial complex
   a) Room and object surface colors and reflectances
   b) Cleanliness of the area during operation
   c) Hours of operation
   d) All of the above

22. Select the illumination level required as per ISI for Kitchen sink
   a) 50 Lux
   b) 100 Lux
   c) 150 Lux
   d) 200 Lux

23. State the various lighting calculations methods?
   a) Lumens or Light flux method
   b) Point to point or Inverse Square law method
   c) Watts per Square meter method
   d) All of the above

24. State the different types of outdoor flood lighting?
   a) Narrow beam Projector
   b) Wide angle Projector
   c) Medium angle Projector
   d) All of the above

2. Electrical Heating and Welding

Position in Question Paper **Total Marks-18**

Q.1. c) 2-Marks.
Q.2. b) 4-Marks.
Q.5. a) 6-Marks.
Q.6. a) 6-Marks.

Descriptive Question

1. State causes of failure of heating element at least four
2. Explain the principal of dielectric heating and its applications?
3. What are the characteristics of heating element? Explain the heating element in
4. Give relative advantages and disadvantages of direct and indirect electric Arc furnance?
5. What is high-frequency eddy current heating?
6. What is pinch effect? What are the types of arc furnaces?
7. Why only D.C. supply is used in case of carbon arc welding?
8. What are the various methods of welding? What are the types of butt welding
9. What are the applications of the electrical welding
10. Discuss the various modes of heat dissipation
11. Briefly explain the different methods of electric heating?
12. Discuss the various modes of heat dissipation
13. Briefly explain the different methods of electric heating?
14. What is electric heating? What are the advantages over other methods of heating?
15. Explain the theory of dielectric heating and state its applications. what are the advantages of dielectric heating?
16. Explain the principal of operation of induction heating and state and explain different type‘s induction heating methods?
17. Define the following terms squeeze time ii)weld time iii)Hold time
18. Explain the difference between carbon and metallic arc weldings. Give their relative merits and demerits
19. What is the fundamental difference between the electric arc welding and the resistance

welding?

MCQ Question

(Total number of Question=Marks*3=18*3=54)

Note: Correct answer is marked with **bold**

1. In arc welding, the temperature of the arc is of the order of
   a) 100° C
   b) 1000° C
   c) 3500° C
   d) 35000° C
2. The arc has
   a) Linear resistance characteristics
   b) Positive resistance characteristics
   c) Negative resistance characteristics
   d) Highly inductive characteristics
3. The Arc can be produced by
   a) AC current only
   b) DC current only
   c) Either AC or DC current
   d) All of the above
4. The resistance of the arc
   a) Decrease with an increase of the current
   b) Increases with increases of the current
   c) Does not depends on current
   d) None of the above
5. In arc welding, the voltage on A.C supply system is in the range
   a) 1000-1200 V
   b) 400-500
   c) **300-400 V**
   d) 300-500 V
6. In arc welding by dc supply, the voltage required is
   a) 10 to 20 V
   b) 50 to 60 V
   c) 100 to 120 V
   d) 200 to 250 V
7. In arc welding, once the arc is struck, the voltage required to maintain the arc will be
   a) 20-30 V
   b) 100-120 V
   c) 200-220 V
   d) 500-1000 V
8. A DC generator used for A.C welding should have
   a) Rising characteristics
   b) Dropping Characteristics
   c) Straight characteristics
   d) All of the above
9. A DC generator used for D.C welding should have

a) Rising characteristics
c) Straight characteristics
b) Dropping Characteristics
d) All of the above

10. Cross-wire welding is.....
a) Multi-spot welding process
b) Continuous spot welding process
c) Used to form mesh
d) Used where additional strength is desired

11.Projection welding is.....
a) Multi-spot welding process
c) Used to form mesh
b) Continuous spot welding process
d) Used to make cantilevers

12.Seam-welding is.....
a) Multi-spot welding process
b) Continuous spot welding process
c) Used to form mesh
d) Used for welding cylindrical objects

13.Thermit welding is a form of.....
a) Resistance welding
c) Fusion welding
b) Gas welding
d) Forge welding

14.TIG welding is best suited for welding.....
a) Mild welding
c) Carbon steel
b) Stainless steel
d) Aluminium

15.Submerged arc welding is.....
a) A process which uses a mixture of iron oxide and granular aluminium
b) Accomplished by maintaining a hot molten metal pool between plates
c) A process in which arc is maintained under a blanket of flux
d) All of the above

16.The electroslag welding is.....
a) A process which uses a mixture of iron oxide and granular aluminium
b) Accomplished by maintaining a hot molten metal pool between plates
c) A process in which arc is maintained under a blanket of flux
d) There is nothing called electroslag

17.Arc-welding uses following electric supply .....
a) A.C.
c) Both AC and DC
b) D.C.
d) Spiral waveform

18. The most commonly used flame in gas welding is.....

a) Neutral
c) Carburising
b) Oxidising
d) All of the above

19.Thermit welding.....

a) A process which uses a mixture of iron oxide and granular aluminium
b) Accomplished by maintaining a hot molten metal pool between plates
c) A process in which arc is maintained under blanket of flux
d) In no welding process

20.Which of the following types of fuel gas is commonly used in gas welding?

a) Biogas
c) Acetylene
b) Coal gas
d) Methane

21.Which of the following is also called "gas welding"?

a) Oxy fuel gas welding
c) Arc welding
b) Metallic welding
d) Fuel gas welding

22.How many types of flames are there in welding?

a) 1
c) 3
b) 2
d) 4

23.In which of the following type of flame, oxygen is of same proportion with acetylene?

a) Neutral flame
b) Oxidizing flame
c) Carburizing flame
d) Both oxidizing flame and carburizing flame

24.In which of the following type of flame, oxygen is in excess proportion with acetylene?

a) Neutral flame
b) **Oxidizing flame**
c) Carburizing flame
d) Both oxidizing flame and carburizing flame

25.In which of the following type of flame, oxygen is deficient in proportion with acetylene?

a) Neutral flame
b) Oxidizing flame
c) Carburizing flame
d) Both oxidizing flame and carburizing flame

26.Which of the following flame is harmful to steel?

a) Neutral flame
b) Oxidizing flame

c) Carburizing flame
d) Both oxidizing flame and carburizing flame

27.For brazing, soldering and flame hardening which of the following flame is used?
a) Neutral flame
b) Oxidizing flame
c) **Carburizing flame**
d) Both oxidizing flame and carburizing flame

28.The inner cone of the flame in welding has the following nature?
a) Highest temperature
b) Coldest temperature
c) Moderate temperature
d) Uncertain

29.The oxy acetylene gas welding is a type of?
a) Endothermic reaction
b) Exothermic reaction
c) Neutral reaction
d) Both endothermic reaction and exothermic reaction

30.The chemical formula of acetylene is?
a) C2H4
b) C2H6
c) C2H5OH
d) C2H2

31.Which of the following process involves metallurgical fusion?
a) Forming
b) Welding
c) Forging
d) Extrusion

32.In welding, two parts are joined by bringing them to a temperature of?
a) **Above melting point temperature**
b) Below melting point temperature
c) Equal to melting point temperature
d) Equal to Curie temperature

33.Which of the following process involves metallurgical fusion?
a) Forming
b) Welding
c) Forging
d) Extrusion

34.In welding, two parts are joined by bringing them to a temperature of?
a) Above melting point temperature
b) Below melting point temperature
c) Equal to melting point temperature
d) Equal to Curie temperature

35.In welding the strength of the joint piece could be?

a) Equal to that of parent metal
b) Greater than that of parent metal
c) Equal or Greater than that of parent metal
d) Is lesser than the parent metal

36.Sodium vapour lamp needs and ionisation voltage of about
a) 5 v
b) 20 v
c) 50 v
d) 100 v

37.The ignition voltage for a sodium lamp is about
a) 100 to 150 v
b) 200 to 250 v
c) 300 to 400 v
d) 400 to 600 v

38.Which of the following is a type of welding joint?
a) Tee joint
b) Lap joint
c) Corner joint
d) All of the Mentioned

39.The oil substances are removed from the interface by using which of the following organic solvent?
a) Acetone
b) Carbon tetrachloride
c) Acetone & Carbon tetrachloride
d) Ethylene glycol

40.Which of the following does not require fluxes to eliminate the oxides present in them?
a) **Mild steel**
b) Copper
c) Aluminium
d) Magnesium

41.The heavier oxide films are removed by using?
a) Basic flux
b) Emery
c) Organic solvents
d) Neutral flux

42.In which of the following welding process no filler material is added during joining?
a) Autogenous
b) Homogenous
c) Heterogenous
d) Either homogenous or heterogenous

43.Which of the following is a type of autogenous welding?
a) Arc
b) Gas
c) Brazing
d) Resistance

44.In which of the following joining process, the filler material used is the same as the parent material?
a) Autogenous
b) Homogenous

c) Heterogenous
d) Either homogenous or heterogenous

45. In which of the following joining process the filler material used is different as the parent material
a) Autogenous
b) Homogenous
c) Heterogenous
d) Either homogenous or heterogenous

46. Which of the following is a type of homogenous welding?
a) Gas
b) Solid phase
c) Brazing
d) Resistance

47. When two insoluble materials such as iron and silver are supposed to join, which of the following joining process is used?
a) Autogenous
b) Homogenous
c) Heterogenous
d) Either homogenous or heterogenous

48. For joining two insoluble materials such as iron and silver which of the following filler material is used?
a) Cobalt
b) **Tin**
c) Aluminium
d) Zinc

49. amount of time during which the transformer will be used for welding under normal loading condition is known as?
a) Hold time
b) Off time
c) Weld time
d) Duty cycle

50. Amount of voltage required to generate the arc under no load condition is called?
a) Open circuit voltage
b) Closed circuit voltage
c) Short circuit voltage
d) Arc voltage

51. Amount of current required to generate the arc under no load condition is called?
a) Open circuit current
b) Closed circuit current
c) Short circuit current
d) Arc current

52. If the open circuit voltage is 60 volt and the short circuit current is 20 amperes. Then determine the voltage required for welding if the current required during welding is 10 amperes?

a) 30 V
c) 20 V
b) 60 V
d) 40 V

53.How does the arc voltage V depends upon the length of arc L?

a) V = f(L)
c) V = f(L2)
b) V = 1/f(L)
d) V = f(√L)

54.Regenerative braking mode can be achieved in which quadrant (V-I curve)?

a) Third
c) Fourth
b) Second
d) First

3. Electrical Drive and Elevator

Position in Question Paper **Total Marks-18**

Q.1. d) 2-Marks.
Q.2. c) 4-Marks.
Q.5. b) 6-Marks.
Q.6. b) 6-Marks.

Descriptive Question

1. State causes of failure of heating element at least four
2. State different types of drives and give three advantages and disadvantages of any one
3. Why electrical drives produces noise? How it is reduces?
4. What is load equalization? Why it is necessary? what are the speed control of
5. Discuss the various factors that groven the choice of a motor for a given
6. Explain the starting characteristics of d.c. motors?
7. Derive the equations of heat time curve and cool time curve?
8. Compare the characteristics of DC series and shunt motor.
9. Explain the different types of drives?
10. Discuss advantages and disadvantages of electric drive over other drives and also explain
11. Explain the various methods of speed control of AC motors.
12. What is an electric drive? What are its advantages?
13. Discuss the running characteristics of any two electric motors
14. Discuss the selection criterion of a motor for a drive application
15. Explain what is mean by —individual drive and Group drive
16. Derive the equations of heat time curve and cool time curve?
17. Explain the starting characteristics of d.c. motors?
18. Discuss the various factors that govern the choice of a motor for a given application
19. Describe the selection of various types of motors for the following services. i)Rolling mills ii)cranes and lifts iii)Textile machinery iv) Printing machine and v) Household

MCQ Question

(Total number of Question=Marks*3=18*3=54)

Note: Correct answer is marked with **bold**

1. The consideration involved in the selection of the type of electric drive for a particular application depends upon
   a) Speed control range and its nature
   b) Starting Nature
   c) Environmental condition
   d) All of the above
2. Which of the following motor is preferred for automatic drives?
   a) Ward Leonard controlled dc motors
   b) Squirrel cage induction motor
   c) Synchronous motors
   d) Shunt Motor
3. _____ drive is also called as Line shaft drive
   a) Individual drive
   b) Multimotor drive
   c) Group Drive
   d) None of the above
4. Load torques can be classified into how many types?
   a) Three
   b) Two
   c) Four
   d) Five
5. Rolling mills exhibit what type of load torque characteristics?
   a) Constant torque characteristics
   b) Linearly rising torque characteristics
   c) Non-Linearly rising torque characteristics
   d) Non-Linearly decreasing torque characteristics
6. What is the relationship between torque and speed in constant type loads?
   a) Torque is independent of speed
   b) Torque linearly increases with increase in speed
   c) Torque non-linearly increases with an increase in speed
   d) Torque non-linearly decreases with an increase in speed
7. What type of force handles for active torques?
   a) Strong nuclear forces
   b) Weak nuclear forces
   c) Gravitational forces
   d) Electrostatic forces
8. What is the condition for the steady-state operation of the motor?
   a) Load torque > Motor torque
   b) Load torque <<<< Motor torque

c) Load torque = Motor torque d) Load torque < Motor torque

9. In which of the following gas welding process a non-consumable electrode is used
   a) Submerged arc welding c) Stud welding
   b) Tungsten inert gas welding d) Gas metal arc welding
10. Fan type of loads exhibits which type of load torque characteristics?
   a) Constant torque characteristics
   b) Linearly rising torque characteristics
   c) Non-Linearly rising torque characteristics
   d) Non-Linearly decreasing torque characteristics
11. Type-A chopper is used for obtaining which type of mode?
   a) **Motoring mode**
   b) Regenerative braking mode
   c) Reverse motoring mode
   d) Reverse regenerative braking mode
12. Calculate the value of angular acceleration of motor using the given data: J = 20 kg-m2, load torque = 20 N-m, motor torque = 60 N-m.
   a) 5 rad/s2 c) 3 rad/s2
   b) **2 rad/s2** d) 4 rad/s2
13. 230V, 10A, 1500rpm DC separately excited motor having resistance of .2 ohm excited from external dc voltage source of 50V. Calculate the torque developed by the motor on full load.
   a) 13.89 N-m c) 13.37 N-m
   b) 14.52 N-m d) 14.42 N-m
14. Boost converter is used to _____
   a) Step down the voltage
   b) **Step up the voltage**
   c) Equalize the voltage
   d) Step up and step down the voltage
15. Calculate the power developed by motor using the given data: Eb = 20V and I = 10 A. (Assume rotational losses are neglected)
   a) 400 W c) 300 W
   b) 200 W d) 500 W
16. Which one is an example of variable loss?
   a) Windage loss **c) Armature copper loss**
   b) Hysteresis loss d) Friction loss

17. What is the empirical formula for the tractive force required to overcome curve resistance? (W-the weight of the body, R – radius of curvature)
    a) 710×W÷R
    c) 720×W÷R
    b) 700×W÷R
    d) 750×W÷R

18. Force resisting the upward motion of a body on an inclined plane is given by (alpha – the angle of inclination, W- the weight of the body).
    a) F = W×sin(alpha)
    c) F = W×sec(alpha)
    b) F = W×cosec(alpha)
    d) F = W×cos(alpha)

19. The unit of the torque is _____
    a) N-m
    c) N-m/sec
    b) N-m2
    d) N-Hz

20. Which of the following motor is preferred for automatic drives?
    a) Ward Leonard controlled dc motors
    b) Squirrel cage induction motor
    c) Synchronous motors
    d) Shunt Motor

21. The consideration involved in the selection of the type of electric drive for a particular application depends upon
    a) Speed control range and its nature
    b) Starting Nature
    c) Environmental condition
    d) All of the above

22. The consideration involved in the selection of the type of electric drive for the Load Variation application depends upon
    a) Constant Load
    c) Pulsating Load
    b) Continuous Variable Load
    d) All of the above

23. _____ drive is also called as Line shaft drive
    a) Individual drive
    c) Group Drive
    b) Multimotor drive
    d) None of the above

24. The travelling speed of cranes varies from
    a) 20 to 30 m/s
    c) 5 to 10 m/s
    b) 10 to 15 m/s
    d) 1 to 2.5 m/s

25. Which of the following motors is preferred when quick speed reversal is the main consideration ?
    a) Squirrel cage induction motor
    b) Wound rotor induction motor

c) Synchronous motor **d) D.C. motor**

26.For crane travel which of the following motors is normally used ?

a) Synchronous motor
b) D.C. differentially compound motor
c) Ward-Leonard controlled D.C. shunt motor
d) A.C. slip ring motor

27.The capacity of a crane is expressed in terms of

a) type of drive c) **tonnes**
b) span d) any of the above

28.The characteristics of drive for crane hoisting and lowering are which of the following?

a) Precise control c) Fast speed control
b) Smooth movement d) **All of the above**

29.Which of the following motor is preferred for boom hoist of a travelling crane ?

a) Single phase motor
b) Synchronous motor
c) **A.C. slip-ring motor**
d) Ward-Leonard controlled D.C. shunt motor

30. For a D.C. shunt motor which of the following is incorrect?

a) **Unsuitable for heavy duty starting**
b) Torque varies as armature current
c) Armature current is a straight line
d) Torque is zero for zero armature current

31.For which of the following applications motor has to start with high acceleration?

a) Oil expeller c) **Lifts and hoists**
b) Floor mill d) Centrifugal pump

32.Which of the following types of motor enclosure is safest ?

a) Totally enclosed c) Open type
b) **Totally enclosed fan cooled** d) Semi closed

33.Which of the following motors has series characteristics ?

a) Shaded pole motor c) Capacitor start motor
b) **Repulsion motor** d) None of the above

34.While selecting motor for an air conditioner which of the following characteristics is of great importance?

a) Type of bearing
b) Type of enclosure

c) **Noise**
d) Arrangement for power transmission

35.the rotor shaft for an electric motor depends on which of the following?
a) r.p.m. only
b) Horse power only
c) **Horse power and r.p.m**.
d) Horse power, r.p.m. and power factor

36.Which of the following alternatives will be cheaper?
a) **A 100 H.P. A.C. three phase motor**
b) Four motors of 25 H.P. each
c) Five motors of 20 H.P. each
d) Ten motors of 10 H.P. each

37. The cost of an induction motor will increase as
a) horsepower rating increases but r.p.m. decreases
b) horsepower rating decreases but r.p.m. increases
c) horsepower rating and operating speed increases
d) horsepower rating and operating speed decreases

38.In series motor which of the following methods can he used for changing the flux per pole ?
a) Tapped field control
b) Divertor field control
c) Series-parallel control
d) Any of the above

39. Which of the following drives is suitable for mines where explosive gas exists?
a) Steam engine
b) Diesel engine
c) **Battery locomotive**
d) Any of the above

40.The wheels of a train, engine as well bogies, are slightly tapered to
a) reduce friction
b) **increase friction**
c) facilitate braking
d) facilitate in taking turns

41.Which of the following is the advantage of electric braking ?
a) **It avoids wear of track.**
b) Motor continues to remain loaded during braking.
c) It is instantaneous.
d) More heat is generated during breaking.

42. Which of the following braking systems on the locomotives is costly ?
a) **Regenerative braking on electric locomotives**
b) Vacuum braking on diesel locomotive

c) Vacuum braking on steam locomotive
d) All braking systems are equally costly

43.Tractive effort is required to
a) overcome the gravity component of train mass
b) overcome friction, windage and curve resistance
c) accelerate the train mass
d) **do all of the above**

44.For given maximum axle load, tractive efforts of A.C. locomotive will be
a) (a) less than that of D.C. locomotive
b) (b) **more than that of D.C. locomotive**
c) (c) equal to that of D.C. locomotive
d) (d) none of the above

45.22. Co-efficient of adhesion reduces due to the presence of which of the following?
a) Sand on rails
b) Dew on rails
c) Oil on the rails
d) **Dew and oil on the rails**

46. Due to which of the following coefficient of adhesion improves ?
a) Rust on the rails
b) Dust on the rails
c) Sand on the rails
d) **All of the above**

47.Quadrilateral speed-time curve pertains to which of the following service?
a) Main lime service
b) Urban service
c) Sub-urban service
d) **Urban and sub-urban service**

48.Which of the following is the disadvantage of electric traction over other systems of traction ?
a) Corrosion problems in the underground pipe work.
b) Short time power failure interrupts traffic for hours.
c) High capital outlay in fixed installations beside route limitation.
d) **All of the above**

49.Speed-time curve of main line service differs from those of urban and sub-urban services on following account
a) it has longer free running period
b) it has longer wresting period
c) accelerating and braking periods are comparatively smaller
d) all of the above

50.The rate of acceleration on suburban or urban services in restricted by the consideration of

a) engine power
b) track curve
c) **passenger discomfort**
d) track size

51.Heavy duty cranes are used in

a) ore handling plants
b) steel plants
c) heavy engineering workshop
d) **all of the above**

52.. In which of the following applications variable speed operation is preferred ?

a) Exhaust fan
b) **Ceiling fan**
c) Refrigerator
d) Water pump

53.. Which of the following machines has heavy fluctuation of load ?

a) Printing machine
b) Punching machine
c) Planer
d) Lathe

54.The consideration involved in the selection of the type of electric drive for the Load Variation application depends upon

e) Constant Load
f) Continuous Variable Load
g) Pulsating Load
h) All of the above

4. Electric Traction

Position in Question Paper **Total Marks-18**

Q.1. e) 2-Marks.
Q.2. d) 4-Marks.
Q.5. c) 6-Marks.
Q.6. c) 6-Marks.

Descriptive Question

1. State advantages and disadvantages of electrical braking system over mechanical system.
2. Explain the all electric braking methods
3. Briefly explain the a.c motors used in traction
4. Explain why a DC series motor is ideally suited for traction purpose.
5. What are the advantages and disadvantages of track electrification?
6. What are the various types of services? Explain all.
7. Draw speed-Time curve of a main line service
8. What do you understand by speed-Time curve? What is its use in practice?
9. Define A) adhesive weight B) coefficient of adhesion C) tractive effort D) dead weight tractive effort specific energy consumption.
10. Derive expression for the tractive effort for a train on a level track?
11. Discuss various factors which are taken into account while deciding the changeover
12. from existing system of electrification to a new system of electrification.
13. What are the requirements of good electric braking?
14. What are the various electric traction systems in India? Compare them.
15. Explain the different methods of the electric braking of the three-phase induction motor.
16. Describe how plugging, rheostat braking, and regenerative braking are employed with
17. The tractive effort for propulsion of train on level track. b) The tractive effort for propulsion of train up and down a gradient.
18. Mention a few advantages of electric traction
19. What are the disadvantages of electric braking?

MCQ Question

(Total number of Question=Marks*3=18*3=54)

Note: Correct answer is marked with **bold**

1. The consideration involved in the selection of the type of electric drive for a particular application depends upon
   a) Speed control range andits nature
   b) Starting Nature
   c) Environmental condition
   d) All of the above
2. Which of the following is an advantage of electric traction over other methods of traction ?
   a) Faster acceleration
   b) No pollution problems
   c) Better braking action
   d) All of the above
3. Which of the following is the voltage for single phase A.C. system ?
   a) **22 V**
   b) 440 V
   c) 5 kV
   d) None of the above
4. Long distance railways use which of the following ?
   a) (a) 200 V D.C.
   b) (b) **25 kV single phase A.C.**
   c) (c) 25 kV two phase A.C.
   d) (d) 25 kV three phase A.C.
5. The speed of a locomotive is controlled by
   a) flywheel
   b) gear box
   c) applying brakes
   d) regulating steam flow to engine
6. Main traction systems used in India are, those using
   a) electric locomotives
   b) diesel engine locomotives
   c) steam engine locomotives
   d) **all of the above**
7. in India diesel locomotives are manufactured at
   a) Ajmer
   b) Varanasi
   c) angalore
   d) Jamalpur
8. For diesel locomotives the range of horsepower is
   a) 50 to 200
   b) 500 to 1000
   c) **1500 to 2500**
   d) 3000 to 5000
9. _____ locomotive has the highest operational availability.
   a) **Electric**
   b) Diesel
   c) Steam
   d) None
10. The horsepower of steam locomotives is
    a) upto 1500
    b) 1500 to 2000

c) 2000 to 3000
d) 3000 to 4000

11.The overall efficiency of steam locomotive is around

a) 5 to 10 percent
c) 25 to 35 percent
b) 15 to 20 percent
d) 35 to 45 percent

12.In tramways which of the following motors is used ?

(a) D.C. shunt motor
(b) **D.C. series motor**
(c) A.C. three phase motor
(d) AC. single phase capacitor start motor

13.In a steam locomotive electric power is provided through

a) overhead wire
c) **small turbo-generator**
b) battery system
d) diesel engine generator

14.. Which of the following drives is suitable for mines where explosive gas exists ?

a) Steam engine
c) Battery locomotive
b) Diesel engine
d) Any of the above

15.In case of locomotives the tractive power is provided by

a) single cylinder double acting steam engine
b) double cylinder, single acting steam engine
c) **double cylinder, double acting steam engine**
d) single stage steam turbine

16.Overload capacity of diesel engines is usually restricted to

a) 2 percent
c) 20 percent
b) 10 percent
d) 40 percent

17.In case of steam engines the steam pressure is

a) 1 to 4 kgf/cm2
c) 10 to 15 kgf/cm2
b) 5 to 8 kgf/cm2
d) 25 to 35 kgf/cm2

18.The steam engine provided on steam locomotives is

a) single acting condensing type
b) single acting non-condensing type
c) double acting condensing type
d) double acting non-condensing type

19.Electric locomotives in India are manufactured at

a) Jamalpur
c) **Chittranjan**
b) Bangalore
d) Gorakhpur

20.The wheels of a train, engine as well as bogies, are slightly tapered to

a) reduce frietion
b) increase friction
c) facilitate braking
d) facilitate in taking turns

21.Automatic signalling is used for which of the following trains ?
a) Mail and express trains
b) **Superfast trains**
c) Suburban and Urban electric trains
d) All trains

22.The efficiency of diesel locomotives is nearly
a) **20 to 25 percent**
b) 30 to 40 percent
c) 45 to 55 percent
d) 60 to 70 percent

23.The speed of a superfast train is
a) 60 kmph
b) 75 kmph
c) 100 kmph
d) **more than 100 kmph**

24.The number of passanger coaches that can be attached to a diesel engine locomotive on broad gauge is usually restricted to
a) 5
b) **10**
c) 14
d) 17

25.. Which of the following state capitals is not on broad gauge track ?
a) Lucknow
b) Bhopal
c) Jaipur
d) Chandigarh

26.Which of the following is the advantage of electric braking ?
a) **It avoids wear of track**
b) Motor continues to remain loaded during braking
c) It is instantaneous
d) More heat is generated during braking

27.Which of the following braking systems on the locomotives is costly ?
a) **Regenerative braking on electric locomotives**
b) Vacuum braking on diesel locomo-tives
c) Vacuum braking on steam locomo-tives
d) All braking systems are equally costly

28.Tractive effort is required to
a) overcome the gravity component of train mass
b) overcome friction, windage and curve resistance
c) accelerate the train mass
d) **do all of the above**

29.For given maximum axle load tractive efforts of AC. locomotive will be
a) less than that of D.C. locomotive
b) **more than that of D.C. locomotive**
c) equal to that of D.C. locomotive
d) none of the above

30. Co-efficient of adhesion reduces due to the presence of which of the following ?
a) Sand on rails
b) Dew on rails
c) Oil on the rails
d) **both (b) and (c)**

31. Due to which of the following co-efficient of adhesion improves ?
a) Rust on the rails
b) Dust on the rails
c) Sand on the rails
d) **All of the above**

32.Quadrilateral speed-time curve pertains to which of the following services ?
a) Main line service
b) Urban service
c) Sub-urban service
d) **Urban and sub-urban service**

33.Which of the following is the disadvantage of electric traction over other systems of traction ?
a) Corrosion problems in the under-ground pipe work
b) Short time power failure interrupts traffic for hours
c) **High capital outlay in fixed instal-lations beside route limitation**
d) Interference with communication lines

34.Co-efficient of adhesion is
a) high in case of D.C. traction than in the case of AC. traction
b) low in case of D.C. traction than in the case of AC. traction
c) equal in both AC. and D.C. traction
d) any of the above

35.Speed-time curve of main line service differs from those of urban and suburban services on following account
a) it has longer free running period
b) it has longer coasting period
c) accelerating and braking periods are comparatively smaller
d) all of the above

36.The rate of acceleration on suburban orurban services is restricted by the consideration of
a) Engine power
b) Track curves
c) Passenger Discomfort
d) Track size

37. The specific energy consumption of a train depends on which of the following ?
a) Acceleration and retardation
b) Gradient
c) Distance covered
d) All of the above

38.37. The friction at the track is proportional to
a) 1/speed
b) l/(speed)2
c) Speed
d) none of the above

39.The air resistance to the movement of the train is proportional to
a) speed
b) (speed)
c) (speed)
d) 1/speed

40.. The normal value of adhesion friction is
a) 0.12
b) **0.25**
c) 0.40
d) 0.75

41.. The pulsating torque exerted by steam locomotives causes which of the following?
a) **Jolting and skidding**
b) Hammer blow
c) Pitching
d) All of the above

42.Which of the following braking systems is used on steam locomotives ?
a) Hydraulic system
b) Pneumatic system
c) **Vacuum system**
d) None of the above

43.Vacuum is created by which of the following?
a) Vacuum pump
b) Ejector
c) Any of the above
d) None of the above

44.The resistance encountered by a train in motion is on account of
a) resistance offered by air
b) friction at the track
c) friction at various parts of the rolling stock
d) all of the above

45.Battery operated trucks are used in
a) steel mills
b) power stations
c) narrow gauge traction
d) factories for material transportation

46.method can bring the locomotive to dead stop.
a) Plugging braking
b) Rheostatic braking
c) Regenerative braking
d) None of the above

47.. The value of co-efficient of adhesion will be high when rails are

a) greased
b) wet
c) sprayed with oil
d) cleaned with sand

48.The voltage used for suburban trains in D.C. system is usually
a) 12 V
b) 24 V
c) 220 V
d) 600 to 750 V

49.For three-phase induction motors which of the following is the least efficient method of speed control ?
a) Cascade control
b) Pole changing
c) Rheostatic control
d) Combination of cascade and pole changing

50.Specific energy consumption becomes
a) more on steeper gradient
b) more with high train resistance
c) less if distance between stops is more
d) **all of the above**

51.. In main line service as compared to urban and suburban service
a) distance between the stops is more
b) maximum speed reached is high
c) acceleration and retardation rates are low
d) **all of the above**

52. Locomotive having monomotor bogies
a) has better coefficient of adhesion
b) are suited both for passanger as well as freight service
c) has better riding qualities due to the reduction of lateral forces
d) **has all above qualities**

53.Series motor is not suited for traction duty due to which of the following account ?
a) Less current drain on the heavy load torque
b) **Current surges after temporary switching off supply**
c) Self relieving property
d) Commutating property at heavy load

54.When a bogie negotiates a curve, reduction in adhesion occurs resulting in sliding. Thus sliding is acute when
a) wheel base of axles is more
b) degree of curvature is more
c) both (a) and (b)
d) none of the above

5. Tariff & Power Factor Improvement

Position in Question Paper **Total Marks-8**

Q.1. f) 2-Marks.
Q.1. g) 2-Marks.
Q.3. d) 4-Marks.

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Descriptive Question

1. Describe the static capacitor method of power factor improvement
2. State advantages of time off day tariff. 3. Derive expression of most economical P.F
3. Enlist disadvantages of low power factor.
4. Compare two part tariff and three part tariff.
5. What are advantages of power factor improvement
6. State the four causes of low (poor) power factor.
7. State the four requirements of Tariff. (ii) State two advantages of P.F. tariff and TOD
8. State and explain four types of tariff applicable to H.T. and industrial consumer
9. Explain the factors affecting framing of tariffs
10. State any four advantages of high power factor.
11. Explain the principle of power factors improvement.

MCQ Question

(Total number of Question=Marks*3=8*3=24)

Note: Correct answer is marked with **bold**

1. Tariff is best defined as:
   a) The duty imposed on exporting electrical equipment
   b) The rate at which electricity is supplied to the consumer
   c) A set of rules explaining the pros and cons of using a specific rating of alternators
   d) None of these
2. Which of the following is an objective of tariff
   a) Recovery of cost on production of power
   b) Recovery of capital investment
   c) Profit gain
   d) All of these
3. Which of following is correct statement about Simple tariff:
   a) Has no discrimination of consumers
   b) Charges more to commercial users
   c) Enoourages use of electricity
   d) Is most commonly used tariff method
4. The tariff in which power factor is taken as reference
   a) Sliding scale tariff
   b) kVA maximum demand tariff
   c) kW and kVAR tariff
   d) All of these
5. Find the overall cost of energy per kWh when annual charges are $30,000 and the annual energy charges are $1,50,000:
   a) $0.2
   b) $2.5
   c) $5
   d) $25
6. Power factor can be improved by connecting which among these?
   a) Static capacitors.
   b) Resistors.
   c) Synchronous condensers.
   d) Both (a) and (c).
7. What is the advantage of the static capacitors?
   a) Low losses.
   b) Easy installation.
   c) Lower maintenance.
   d) **All of the above**.
8. Which among these is the advantage of synchronous condensers?
   a) **Helps in achieving the stepless control of power factor**.
   b) The motor windings have a lower thermal stability.
   c) The maintenance cost is low.

d) All of the above.

9. Phase advancers are used for which among the following machines?
   a) Transformers
   b) Synchronous machines.
   c) **Induction motors.**
   d) DC machines.

10. What is the main disadvantage of phase advancers?
   a) Cannot be used for motors below 200 H.P
   b) Produces noise.
   c) Can be used where synchronous motor is un admissible.
   d) None of these.

11. The most suitable location for the power factor improvement device is
   a) Near the electrical appliance which is responsible for the poor power factor.
   b) At the sending end.
   c) At the receiving end in case of transmission lines.
   d) Both (a) and (c).

12. A synchronous motor takes the leading current when it is
   a) Overexcited
   b) Under excited
   c) Not excited
   d) Either (a) or (b)

13. For voltage boosting in distribution networks the capacitors used is
   a) Series capacitors
   b) Shunt capacitors
   c) Both (a) and (b)
   d) None of these

14. To reduce the power consumption, the capacitors should be located
   a) As close as possible to the load
   b) As far as possible to the load
   c) Not too close not too far from the load
   d) All of these

15. If an alternator is supplying load of 350 kW at 0.6 pf lagging and its power factor is raised to unity then to supply the alternator for the same kVA loading, the extra required kilowatts will be
   a) 205 kW
   b) 212 kW
   c) **233 Kw**
   d) 246 kW

16. In order to improve the power factor of equipment operating at lagging power factor, a capacitor is connected
   a) In series with the equipment
   b) **In parallel with the equipment**
   c) In series-parallel with the equipment

d) Either (a) or (b)

17.Phase advancers are used to improve the power factor of

a) **Induction motors**
b) Induction generators
c) Synchronous motors
d) Synchronous generators

18.Power factor of a load can be improved by using

a) Static capacitors
b) Synchronous condenser
c) Phase advancer
d) **All of the above**

19.If power factor is less than unity then it will result in

a) Large kVA rating of equipment
b) Greater conductor size
c) Large copper losses
d) All of these

20.If the load current decreases then the power factor

a) Will also decrease
b) **Will increase**
c) Will remains unchanged
d) None of these

21.The wattles component is

a) I
b) I cosØ
c) **I sinØ**
d) None of these

22.The electrical power developed by a hydroelectric plant is given by _____.

a) P = (735.5 / 75) Q H η kW
b) P = (75/735.5) Q H η kW
c) P = (75 * 735.5) Q H η kW
d) P = 7 / (75 * 735.5) Q H η kW

23.In a hydro plant, if the discharge is 200 m3/s and the head of the water is 100 m. If the efficiency of the turbine alternator is set to 0.85, find the power developed

a) 66.67 MW
b) **166.7 MW**
c) 667.8 MW
d) 176.52 MW

24.Power factor is a ratio of:

a) True power to apparent power
b) Apparent power to true power
c) Sum of real and reactive to apparent power
d) Apparent power to (real – reactive) power