MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO
JUNIOR ENGINEER (J.E) CONTRACT BASIS
UNDER RURAL DEVELOPMENT DEPARTMENT, NOVEMBER, 2016.

ELECTRICAL ENGINEERING
PAPER - II

Time Allowed : 2 hours

Full Marks : 150

*All questions carry equal marks of **2** each.*
Attempt all questions

1. Five limb core construction is preferred over three limb construction as in this type of construction:
   (a) Hysteresis loss is reduced
   (b) Eddy current loss is reduced
   (c) Magnetic reluctance of the three phases can be balanced
   (d) Copper losses can be reduced

2. The distribution transformer is designed with minimum possible core losses. This is because:
   (a) The primary of the distribution transformer is energized for all 24 hours
   (b) Iron losses will cause undue heating
   (c) Iron losses may cause damage to the insulation
   (d) All of these

3. Which of the following transformer connection will give highest secondary voltage:
   (a) Delta primary, delta secondary (b) Delta primary, star secondary
   (c) Star primary, delta secondary   (d) Star primary, star secondary

4. Major insulation in a transformer is the insulation between the:
   (a) LV wining and core   (b) LV winding and HV winding
   (c) Turns of the windings   (d) Both (a) and (b)

5. The transformer oil should have:
   (a) High volatility   (b) High viscosity
   (c) High dielectric strength (d) All of these

6. For minimum weight of the transformer, the iron weight should be __ the weight of the copper:
   (a) More than   (b) Equal to
   (c) Less than   (d) None of these

7. The main purpose of using core in a transformer is to
   (a) Decrease iron losses
   (b) Prevent eddy current losses
   (c) Eliminate magnetic hysteresis losses
   (d) Decrease reluctance of the common magnetic circuit

8. Transformer core are laminated in order to
   (a) Simplify its construction (b) Minimise eddy current loss
   (c) Reduce cost   (d) Reduce hysteresis loss

9. In an ideal transformer, the no load primary current I_0
   - (a) Lags behind V_1 by 90°
   - (b) Is in phase with V_1
   - (c) Lead V_1 by 90°
   - (d) Lag V_1 by 45°

10. A transformer has negative voltage regulation when its load load power factor is
    - (a) Zero
    - (b) Unity
    - (c) Leading
    - (d) Lagging

11. The main purpose of performing open-circuit test on a transformer is to measure its
    - (a) Copper loss
    - (b) Core loss
    - (c) Efficiency of transformer
    - (d) Insulation resistance

12. The ordinary efficiency of a given transformer is maximum when
    - (a) It run at half full load
    - (b) It run at full load
    - (c) Its Cu loss equal to Iron loss
    - (d) It run at 75 % of full load

13. The capacity of cell is measured in
    - (a) Watt-hour
    - (b) Watts
    - (c) Amperes
    - (d) Ampere-hour

14. The ratio of Ah efficiency to Wh efficiency of lead-acid cell is
    - (a) Always less than one
    - (b) Just one
    - (c) Always greater than one
    - (d) None of these

15. Trickle charging of a storage battery helps to
    - (a) Prevent suphation
    - (b) Keep it fresh and fully charge
    - (c) Maintain electrolyte level
    - (d) Increase it reserve capacity.

16. The effect of increasing the length of air-gap in the induction motor will be increase the
    - (a) Power factor
    - (b) Speed
    - (c) Magnetising current
    - (d) Air gap flux

17. In 3ph induction motor, the rotor field rotates at synchronous speed with respect to
    - (a) Stator
    - (b) Rotor
    - (c) Stator flux
    - (d) None of these.

18. The main reason why the rotor of an induction motor runs in the same direction as the rotating stator magnetic flux is to meet the requirement of
    - (a) Lenz's law
    - (b) Faraday's law
    - (c) Fleming's Left-hand rule
    - (d) Fleming's Right-hand rule

19. A 6-pole, $50H_z$, 3ph induction motor has a full-load speed of 950 rpm. At half-load, its speed would be____rpm
    - (a) 475
    - (b) 500
    - (c) 975
    - (d) 1000

20. The principle of operation of a 3ph induction motor is most similar to that of a
    - (a) Synchronous motor
    - (b) Repulsion-start induction motor
    - (c) Transformer with a shorted secondary
    - (d) Capacitor start, induction motor

21. The efficiency and pf of a squirrel-cage induction motor increase in proportion to its
    - (a) Speed
    - (b) Mechanical load
    - (c) Voltage
    - (d) Rotor torque

22. An unexcited single phase synchronous motor is

    (a) Reluctance motor   (b) Repulsion motor

    (c) Universal motor   (d) AC series motor

23. The maximum power developed in the synchronous motor will depend on

    (a) rotor excitation only

    (b) maximum value of coupling angle

    (c) supply voltage only

    (d) rotor excitation supply voltage and maximum value of coupling angle

24. In case the field of a synchronous motor is under excited, the power factor will be

    (a) leading   (b) lagging

    (c) zero   (d) unity

25. A synchronous motor is switched on to supply with its field windings shorted on themselves. It will

    (a) not start

    (b) start and continue to run as an induction motor

    (c) start as an induction motor and then run as synchronous motor

    (d) bum immediately

26. If the flux per pole of a shunt-wound DC generator is halved, the generated e.m.f. at constant speed

    (a) is doubled   (b) is halved

    (c) remains the same   (d) none of these

27. An over excited synchronous motor draws current at

    (a) lagging power factor   (b) leading power factor

    (c) unity power factor   (d) depends on the nature of load

28. The starting torque of a simple squirrel-cage motor is:

    (a) Low   (b) Increase as rotor current rises

    (c) Decreases as rotor current rises   (d) High

29. What is the ratio of no load speed to full load speed of a 200 kVA, 12 pole, 2200 V, 3 phase, 60 Hz synchronous motor?

    (a) 1   (b) 1.1

    (c) 1.21   (d) infinite

30. The hunting in a synchronous motor takes place when

    (a) friction in bearings is more   (b) air gap is less

    (c) load is variable   (d) load is constant

31. V curves for a synchronous motor represent relation between

    (a) field current and speed   (b) field current and power factor

    (c) power factor and speed   (d) armature current and field current

32. A 4-pole three-phase induction motor has a synchronous speed of 25 revls. The frequency of the supply to the stator is:

    (a) 50 Hz   (b) 100 Hz

    (c) 25 Hz   (d) 12.5 Hz

33. A capacitor start single phase induction motor will usually have a power factor of

    (a) unity   (b) 0.8 leading

    (c) 0.6 leading   (d) 0.6 lagging

34. The starting torque of a capacitor start motor is

(a) zero

(b) low

(c) same as rated torque

(d) more than rated torque.

35. The direction of rotation of universal motor can be reversed by

(a) reversing the supply terminals

(b) switching over from ac to dc

(c) interchanging the brush leads

(d) any of these

36. For ceiling fans generally the single phase motor used is

(a) split phase type

(b) capacitor start type

(c) capacitor start and run type

(d) permanent capacitor type

37. Reluctance motors are

(a) doubly excited

(b) singly excited

(c) either doubly excited or singly excited

(d) none of these

38. The snubber circuit is used in thyristor circuits for

(a) triggering

(b) dv/dt protection

(c) di/dt protection

(d) phase shifting

39. Traic cannot be used in

(a) Ac voltage regulator

(b) Cycloconverter

(c) Solid state type of switch

(d) Inverter

40. Two thyristors A and B have rated gate current of 100 mA and 2 A respectively.

(a) B is GTO and A is conventional thyristor

(b) A is GTO and B is conventional thyristor

(c) Thyristor A may opearate as transistor

(d) None of these

41. In a thyristor controlled reactor, the firing angle of thyristor is to be controlled in the range of

(a) 0° to 90°

(b) 0° to 180°

(c) 90° to 180°

(d) 90° to 270°

42. The knee voltage (cut in voltage) of Si diode is

(a) 0.2 V

(b) 0.7 V

(c) 0.8 V

(d) 1.0 V

43. When the diode is forward biased, it is equivalent to

(a) An off switch

(b) An On switch

(c) A high resistance

(d) None of these

44. Avalanche breakdown in a diode occurs when

(a) Potential barrier is reduced to zero.

(b) Forward current exceeds certain value.

(c) Reverse bias exceeds a certain value.

(d) None of these

45. When a reverse bias is applied to a diode, it will

(a) Raise the potential barrier

(b) Lower the potential barrier

(c) Increases the majority-carrier a current greatly

(d) None of these above

46. The snubber circuit is used in thyristor circuits for

(a) Triggering

(b) dv/dt protection

(c) di/dt protection

(d) phase shifting

47. In a 3-phase bridge rectifier circuit for HVDC transmission, the ratio of output dc voltage to input ac voltage is

(a) 0.5   (b) 1.0

(c) 1.71   (d) 2

48. The quality of output ac voltage of a cycloconverter is improved with

(a) Increase in output voltage at reduced frequency

(b) Increase in output voltage at increased frequency

(c) decrease in output voltage at reduced frequency

(d) decrease in output voltage at increased frequency

49. In a three phase voltage source inverter operating in square wave mode, the output line voltage is free from

(a) 3rd harmonic   (b) 7th harmonic

(c) 11th harmonic   (d) 13th harmonic

50. Which of the following configurations is used for both motoring and generative braking?

(a) First quadrant chopper   (b) Second quadrant chopper

(c) Two quadrant chopper   (d) Four quadrant chopper

51. Sodium vapor lamps are preferred over incandescent bulb because of

(a) higher tolerance to voltage fluctuations   (b) higher intensity of illumination

(c) longer life   (d) none of these

52. In case of fluorescent lamp if only the ends of the lamp remain lighted it indicates

(a) a short circuited starter   (b) a defective choke

(c) a defective tube   (d) under voltage of supply

53. The light output of fluorescent lamp is around

(a) 10 lumens/watt   (b) 20 lumens/watt

(c) 70 lumens/watt   (d) 200 lumens/watt

54. Solar Constant is

(a) $140 \, Wm^{-2}$ (b) $1.4 \, Wm^{-2}$

(c) $1.4 \, kWm^{-2}$ (d) $1.4 \, MWm^{-2}$

55. Which of these is not a renewable source of energy

(a) The sun   (b) Natural gas

(c) Wind   (d) Ocean tidal energy

56. A solar cell converts

(a) heat energy into electrical energy   (b) solar energy into electrical energy

(c) heat energy into light energy   (d) solar energy into light energy

57. The voltage of a single solar cell is

(a) 0.5 V   (b) 1 V

(c) 1.1 V   (d) 5 W

58. The output of a solar cell is of the order of

(a) 0.1 W   (b) 0.5 W

(c) 1 W   (d) 5 W

59. The maximum theoretical efficiencies of solar sales could be around

(a) 99%   (b) 60%

(c) 48%   (d) 1%.

60. Thermal storage of energy is possible in the form of

    (a) sensible heat   (b) latent heat

    (c) chemical reaction   (d) any of the above.

61. The major disadvantage, with solar cells for power generation is

    (a) lack of availability   (b) large area requirement

    (c) variable power   (d) high cost

62. Which of the following area is preferred for solar thermal electric plants ?

    (a) mountain tops   (b) hot arid zones

    (c) coastal areas   (d) high rainfall zones.

63. Windmill towers are generally more productive if they are

    (a) higher, to minimize turbulence and maximize wind speed

    (b) lower, to minimize turbulence and maximized wind speed

    (c) lower, to increase heat convection from the ground

    (d) higher, to increase heat convection from the ground

64. A major disadvantage of solar power is ___

    (a) its cost effectiveness compared to other types of power

    (b) its efficiency level compared to other types of power

    (c) the variation in sunshine around the world

    (d) lack of knowledge on long-term economic impacts

65. The source of energy of the sun is

    (a) nuclear fission   (b) chemical reaction

    (c) nuclear fusion   (d) photo electric effect

Directions (Questions 66): Choose the correct alternative that will continue the same pattern and replace the question mark in the given series.

66. 120, 99, 80, 63, 48 ?

    (a) 35   (b) 38

    (c) 39   (d) 40

67. Study the following table and answer the questions based on it.
Expenditures of a Company (in Lakh Rupees) per Annum Over the given Years.

Year	Item of Expenditure				
	Salary	Fuel and Transport	Bonus	Interest on Loans	Taxes
1998	288	98	3.00	23.4	83
1999	342	112	2.52	32.5	108
2000	324	101	3.84	41.6	74
2001	336	133	3.68	36.4	88
2002	420	142	3.96	49.4	98

What is the average amount of interest per year which the company had to pay during this period?

    (a) Rs. 32.43 lakhs   (b) Rs. 33.72 lakhs

    (c) Rs. 34.18 lakhs   (d) Rs. 36.66 lakhs

68. Arrange the words given below in a meaningful sequence.

    1. Word   2. Paragraph   3. Sentence

    4. Letters   5. Phrase

    (a) 4, 1, 5, 2, 3   (b) 4, 1, 3, 5, 2

    (c) 4, 2, 5, 1, 3   (d) 4, 1, 5, 3, 2

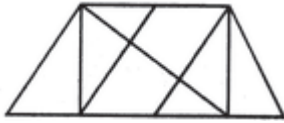**69.** Arrange the words given below in a meaningful sequence.

    1. Police   2. Punishment   3. Crime

    4. Judge   5. Judgement

    (a) 3, 1, 2, 4, 5   (b) 1, 2, 4, 3, 5

    (c) 5, 4, 3, 2, 1   (d) 3, 1, 4, 5, 2

Directions (Questions 70): Pick out the most effective word(s) from the given words to fill in the blank to make the sentence meaningfully complete.

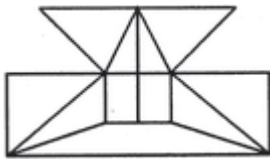**70.** Catching the earlier train will give us the ...... to do some shopping.

    (a) chance   (b) luck

    (c) possibility   (d) occasion

71. Find the number of triangles in the given figure.

    (a) 8   (b) 10

    (c) 12   (d) 14

72. Find the minimum number of straight lines required to make the given figure.

    (a) 16   (b) 17

    (c) 18   (d) 19

Directions (Questions 73): In each of the following questions, arrange the given words in a meaningful sequence and thus find the correct answer from alternatives.

73. Y is in the East of X which is in the North of Z. If P is in the South of Z, then in which direction of Y, is P?

    (a) North   (b) South

    (c) South-East   (d) None of these

Directions (Questions 74): *Find the statement that must be true according to the given information.*

74. Vincent has a paper route. Each morning, he delivers 37 newspapers to customers in his neighbourhood. It takes Vincent 50 minutes to deliver all the papers. If Vincent is sick or has other plans, his friend Thomas, who lives on the same street, will sometimes deliver the papers for him.

   (a) Vincent and Thomas live in the same neighbourhood.

   (b) It takes Thomas more than 50 minutes to deliver the papers.

   (c) It is dark outside when Vincent begins his deliveries.

   (d) Thomas would like to have his own paper route.

Directions (Questions 75): *Read the question carefully and choose the correct answer.*

75. Four people witnessed a mugging. Each gave a different description of the mugger. Which description is probably right?

   (a) He was average height, thin, and middle-aged.

   (b) He was tall, thin, and middle-aged.

   (c) He was tall, thin, and young.

   (d) He was tall, of average weight, and middle-aged.

* * * * * * *