MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR
PRINCIPAL, GOVT. INDUSTRIAL TRAINING INSTITUTE
UNDER LABOUR, EMPLOYMENT, SKILL DEVELOPMENT & ENTREPRENEURSHIP
DEPARTMENT, GOVERNMENT OF MIZORAM, JANUARY-2024

MECHANICAL ENGINEERING
PAPER-III

Time Allowed : 3 hours

FM : 200

### SECTION - A *(Multiple Choice questions) (100 Marks)*
All questions carry equal mark of 2 each. Attempt all questions.
*This Section should be answered only on the **OMR Response Sheet** provided.*

1. The property of a material which enables it to retain the deformation permanently, is called
   - (a) brittleness
   - (b) ductility
   - (c) malleability
   - (d) plasticity

2. The fuel used in a blast furnace is
   - (a) coal
   - (b) coke
   - (c) wood
   - (d) producer gas

3. The carbon in the pig iron varies from
   - (a) 0.1 to 0.5%
   - (b) 0.5 to 1%
   - (c) 1 to 5%
   - (d) 5 to 10%

4. Which of the following iron exist between 910°C and 1403°C?
   - (a) α-iron
   - (b) β-iron
   - (c) γ-iron
   - (d) δ-iron

5. Arc stability is better with
   - (a) AC welding
   - (b) DC welding
   - (c) Both AC and DC welding
   - (d) Specially designed wave forms

6. Brass is an alloy of
   - (a) Copper and zinc
   - (b) Tin and zinc
   - (c) Copper and tin
   - (d) Copper and Al

7. Recrystallization temperature is one
   - (a) At which crystals first start forming from molten metal when it is cooled
   - (b) At which new spherical crystals first begin to form from the old deformed one when a strained metal is heated
   - (c) At which change of allotropic form takes place
   - (d) At which crystals grow bigger in size

8. In inventory planning, extra inventory is unnecessarily carried to the end of the planning period when using one of the following lot size decision policies:
   - (a) Lot for lot production
   - (b) Economic order quantity (EOQ) lot size
   - (c) Period order quantity (POQ) lot size
   - (d) Part period total cost balancing

9. A company uses 2555 units of an item annually. Delivery lead time in 8 days. The recorder point (in number of units) to achieve optimum inventory is:
   - (a) 7
   - (b) 8
   - (c) 56
   - (d) 60

10. For a product, the forecast and the actual sales for December 2002 were 25 and 20 respectively. If the exponential smoothing constant (α) is taken as 0.2, the forecast sales for January 2003 would be:-
    - (a) 21
    - (b) 23
    - (c) 24
    - (d) 27

11. Continuous chips with built up edge are formed during machining of
    - (a) brittle metals
    - (b) ductile metals
    - (c) hard metals
    - (d) soft metals

12. The type of tool used on milling machine and broaching machine is
    - (a) single point cutting tool
    - (b) two point cutting tool
    - (c) three point cutting tool
    - (d) multi-point cutting tool

13. The purpose of a riser is to
    - (a) deliver molten metal into the mould cavity
    - (b) act as a reservoir for the molten metal
    - (c) feed the molten metal to the casting in order to compensate for the shrinkage
    - (d) deliver the molten metal from pouring basin to gate

14. The temperature produced by oxy-hydrogen flame is about
    - (a) 1800°C
    - (b) 2100°C
    - (c) 2400°C
    - (d) 3200°C

15. If the demand for an item is doubled and the ordering cost halved, the economic order quantity-
    - (a) Remains unchanged
    - (b) Increases by factor of $\sqrt{2}$
    - (c) Is doubled
    - (d) Is halved

16. The crystal structure of austenite is-
    - (a) BCC
    - (b) FCC
    - (c) HCP
    - (d) Body centred tetragonal

17. Mild steel belongs to the following category-
    - (a) Low carbon steel
    - (b) Medium carbon steel
    - (c) High carbon steel
    - (d) Alloy steel

18. Which of the following constituents of steels is softest and least strong-
    - (a) Austenite
    - (b) Pearlite
    - (c) Ferrite
    - (d) Cementite

19. Break-even point is the point where
    - (a) fixed and variable cost lines intersect
    - (b) fixed and total cost lines intersect
    - (c) variable and total cost lines intersect
    - (d) sales revenue and total expensive lines intersect

20. In a network shown in the figure, the critical path is along
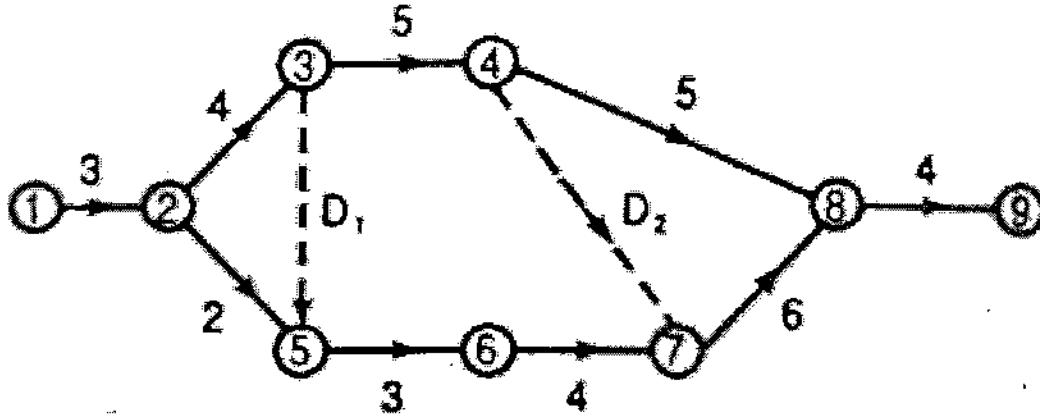
(a) 1-2-3-4-8-9   (b) 1-2-3-5-6-7-8-9

(c) 1-2-3-4-7-8-9   (d) 1-2-5-6-7-8-9

21. Gantt chart is used for

(a) inventory control   (b) material handling

(c) production schedule   (d) machine repair schedules

22. The standard time for a job is

(a) total work content

(b) basic time + relaxation time

(c) total work content + basic time

(d) total work content + delay contingency allowance

23. Job evaluation is the method-of determining the

(a) relative worth of jobs   (b) skills required by a worker

(c) contribution of a worker   (d) contribution of a job

24. The basic difference between PERT and CPM is that

(a) PERT deals with events and CPM with activities

(b) critical path is determined in PERT only

(c) costs are considered on CPM only and not in PERT

(d) guessed times are used in PERT and evaluated times in CPM

25. Dental castings and turbine blades are produced by

(a) Centrifugal casting   (b) Investment casting

(c) Die casting   (d) Sand casting

26. The workers are hell bent at getting what is due to them

(a) hell bent for getting   (b) hell bent on getting

(c) hell bent upon getting   (d) No improvement

Directions (Question Nos. 27 & 28) : Choose the one which can be substituted for the given word/ sentence.

27. Extremely old age when man behaves like a fool

(a) Imbecility   (b) Senility

(c) Dotage   (d) Superannuation

28. The study of ancient societies

    (a) Anthropology   (b) Archaeology

    (c) History   (d) Ethnology

Directions (Question Nos. 29 & 30) : Choose the word which best expresses the meaning of the given word.

29. CORPULENT

    (a) Lean   (b) Gaunt

    (c) Emaciated   (d) Obese

30. EMBEZZLE

    (a) Misappropriate   (b) Balance

    (c) Remunerate   (d) Clear

Directions (Question Nos. 31 & 32) : Choose the correct meaning of proverb/idiom

31. To make clean breast of

    (a) To gain prominence   (b) To praise oneself

    (c) To confess without of reserve   (d) To destroy before it blooms

32. Rub shoulders with

    (a) come in contact with   (b) quarrel with a person

    (c) rub shoulder of someone   (d) accept a challenge
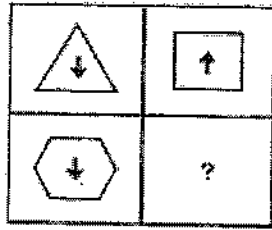
33. Which shape comes next in the sequence
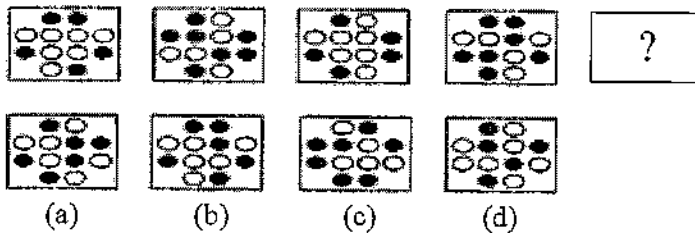
    (a)   (b)   (c)   (d)

34. Complete the sequence
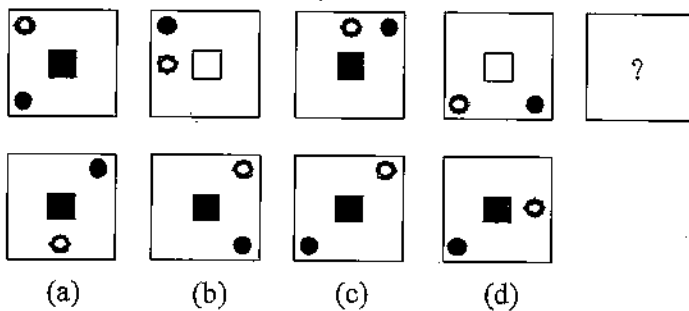
    (a)   (b)   (c)   (d)

35. Which of the following best matches the relationship between the shapes in the image?

(a) (b) (c) (d)

36. Which of the following diagrams indicates the best relation between Factory, Product and Machinery?
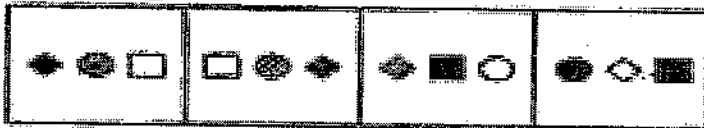
(a)

(b)

(c)

(d)

37. Identify the change in shape and fill up the blank:

(a) (b) (c) (d)

38. Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?

(a) 9

(b) 10

(c) 12

(d) 20

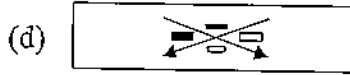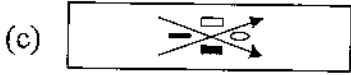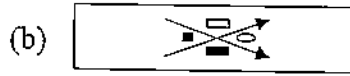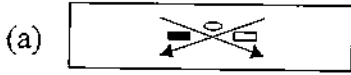**39.** Which of the given shapes is a rotation of the main image?

(a) (b) (c) (d)

40. Which of the 4 figures presented (A, B, C, D) is a rotation of the first?

(a)

(b)

(c)

(d)
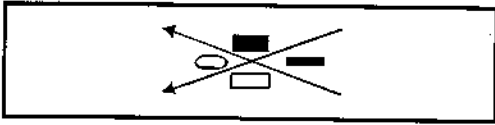
41. Which object can be made by folding the given shape?

(a)

(b)

(c)

(d)
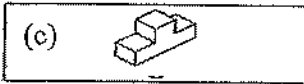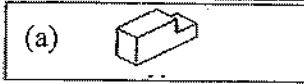
42. Which of these images is the top view of the given object?

(a)

(b)

(c)

(d)
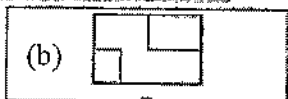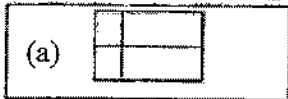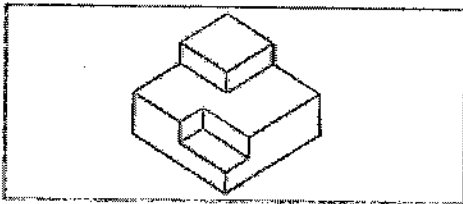
43. Find the odd word

Bhagwad Geeta; Quran; Ramayana; Mahabharata

(a) Quran
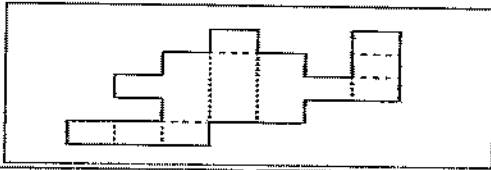(b) Bhagwad Geeta
(c) Ramayana
(d) Mahabharata

44. Find the odd pair out

(a) AZ
(b) BY
(c) CX
(d) DV

45. A hater of knowledge and learning

(a) Misologist
(b) Bibliophile
(c) Philologist
(d) Mysogynist

46. A person who renounces the world and practices self – discipline in order to attain salvation

    (a) Devotee   (b) Sceptic

    (c) Ascetic   (d) Antiquarian

Directions to solve Question Nos. 47 - 48 : In each of the following questions, there is some relationship between the two terms to the left of (: :) and the same relationship holds between the two terms to its right. Also, in each question, one term either to the right of (: :) or to the left of it is missing. This term is given as one of the alternatives given below each question. Find out this term.

47. NO : RS : : TU : ?

    (a) XY   (b) YX

    (c) ZY   (d) YZ

48. HCM : FAK : : SGD : ?

    (a) QEB   (b) QIB

    (c) ESQ   (d) GES

Direction to solve Question Nos. 49 - 50 : In each of the following questions, one number is wrong in the series. Find out the wrong number

49. 1, 2, 5, 14, 41, 124

    (a) 2   (b) 5

    (c) 14   (d) 124

50. 6, 12, 21, 32, 45, 60

    (a) 6   (b) 12

    (c) 21   (d) 35

SECTION - B *(100 Marks)*
All questions carry equal marks of 10 each.
*This Section should be answered only on the **Answer Sheet** provided.*

1. How is an arc obtained in arc welding? What are the advantages of AC equipment over DC equipment in arc welding? Why is a neural flame extensively used in oxy-acetylene gas welding? Describe the oxy-acetylene gas welding technique.   **(2.5+2.5 + 2.5 + 2.5=10)**

2. An industry estimates that it will sell 15000 units of its product for the forthcoming year. The ordering cost is Rs 200 per order and the carrying cost per unit per year is 20 percent of the purchase price per unit. The purchase price per unit is Rs 100. Find (i) Economic order quantity (ii) No. of orders per year (iii) Time between successive orders.   **(10)**

3. Explain Iron-carbon diagram. Also, discuss the various transformations which are taking place at different temperatures.   **(10)**

4. Distinguish between "welding", "brazing" and "soldering" processes.   **(10)**

5. Explain orthogonal cutting and oblique cutting.   **(10)**

6. Explain the following terms used in surface finish measurement: (i) Roughness, (ii) Waviness, (iii) Effective profile, (iv) Sampling length, (v) Lay.   **(2 +2 + 2 + 2 + 2=10)**

7. A welding operation is being performed with voltage = 30 V and current = 100 A. The cross-sectional area of the weld bead is 20 mm². The work-piece and filler are of titanium for which the specific energy of melting is 14 J/mm³. Assuming a thermal efficiency of the welding process 70%, determine the welding speed in mm/s.   **(10)**

8. Deduce the Material Removal Rate (MRR) formula for USM process. Glass is being machined at MRR of 6 mm³/min, abrasive grits having a grit diameter of 150 μm. If 100 μm grits were used, what would be the MRR?   **(6 + 4=10)**

9. What are the limitations of EOQ model?   **(10)**

10. What are the advantages of linear programming approach? State the limitation of linear programming.   **(10)**

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