

DO NOT OPEN THIS TEST BOOKLET TILL YOU ARE ASKED TO DO SO.

TR / TES / M-II / DEG/ 16

Test Booklet Series

TEST BOOKLET
MECHANICAL ENGINEERING PAPER – II
(DEGREE)

B

(Signature of the Candidate)

(Invigilator's Signature)

Time Allowed–3 hours (Three hours)

Maximum Marks–200

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY TEST BOOKLET OF SAME SERIES.
2. **ENCODE CLEARLY THE TEST BOOKLET SERIES IN THE APPROPRIATE PLACE IN THE ANSWER SHEET BY BLACK BALL POINT PEN ONLY.**
3. This Test Booklet is divided into three sections, i.e **Section - A, Section - B & Section - C.**
 - (A) **Section -A (MCQ pattern)** contains 40 items (questions). Each question, carrying 2 (two) marks only, has four responses (answers). You will select the response which you want to mark on the **OMR Sheet**. In case you feel that there is more than one correct response, mark the response which you consider the most appropriate. In any case, choose **ONLY ONE** response for each item. There shall be no negative marking for wrong / multiple answer.
 - (B) Questions under **Section -B (Conventional Method) & Section -C (Conventional Method)** are to be answered in separate **answer book**.
4. You **have** to mark all your responses of **Section - A by Black Ball Point Pen only** on the separate Answer Sheet provided. See directions in the Answer Sheet.
5. Before you proceed to answer the responses to various items in the Test Booklet, you have fill in some particulars both in the Answer sheet for Section-A and in the Answer Book for Section-B and Section-C
6. On completion of the Examination, you should hand over the OMR Answer Sheet for Section – A & Answer Book for Section – B & C to the Invigilator only. You are permitted to take the Test Booklet with you.
7. Sheets for rough work are appended on the Test Booklet at the end.

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All symbols have their usual meanings.

SECTION – A

Answer *all* questions. Each question carries 2 marks.

40×2=80

Choose the correct answer from the four alternatives provided with each question and mark on the OMR Sheet.

Example : The refrigerant number R-40 means

- | | |
|---------------------|--|
| (A) Carbon dioxide | (B) Ammonia |
| (C) Sulphur dioxide | ☒ (D) Methyl chloride |

- Locii of the series of state change during heat addition to a gas shall be
 - Process
 - Path
 - State change
 - All of the above
- Which of the following is not property of thermodynamic system ?
 - Temperature
 - Work
 - Pressure
 - Internal energy
- In reference to thermodynamic equilibrium, it is required to have
 - Mechanical equilibrium
 - Chemical equilibrium
 - Thermal equilibrium
 - Mechanical, chemical and thermal equilibrium
- A polytropic process $p v^n = C$ having the value of index 'n' as infinity refers to
 - Isobaric process
 - Isochoric process
 - Isothermal process
 - None of these
- Enthalpy remains constant during
 - Throttling process
 - Free expansion
 - Isothermal process
 - None of these
- Change in internal energy in a reversible process occurring in closed system will be equal to heat transferred if process occurs at constant
 - pressure
 - volume
 - temperature
 - enthalpy

7. Law of energy conservation is also stated by
- Zeroth law of thermodynamics
 - First law of thermodynamics
 - Second law of thermodynamics
 - Third law of thermodynamics
8. Efficiency of Carnot engine depends upon the highest and lowest.
- Temperatures
 - Pressures
 - Volumes
 - None of these
9. A heat engine has efficiency of 60% and operates between temperatures of T_1 and 300K. What shall be the temperature T_1 ?
- 120 K
 - 750 K
 - 200 K
 - None of these
10. For a reversible engine cycle the clausius inequality says :
- $\oint \frac{dQ}{T} > 0$
 - $\oint \frac{dQ}{T} < 0$
 - $\oint \frac{dQ}{T} = 0$
 - None of these
11. One ton of refrigeration is equivalent to
- 3.87 kJ / s
 - 3.0 kJ / s
 - 56 kcal / min
 - none of these
12. For the compression of refrigerant beginning with wet state of refrigerant in compressor, the compression process is called
- Dry compression
 - Wet compression
 - Adiabatic compression
 - None of these
13. In ammonia - water absorption system, the separation of ammonia from strong aqua-ammonia solution requires
- heat addition to it
 - heat extraction from it
 - no energy interaction
 - none of these
14. If air is passed over the cooling coils then this process is termed as
- Sensible cooling
 - Cooling with humidification
 - Cooling with dehumidification
 - None of these

15. Which of the following is demerit with vapour compression system over air refrigeration system ?
- (A) large initial investment
 - (B) small refrigerant requirement
 - (C) smaller operating cost
 - (D) All of these
16. Heat transfer by providing fins on a given surface will be more if there are
- (A) fewer number of thin fins
 - (B) fewer number of thick fins
 - (C) large number of thin fins
 - (D) large number of thick fins
17. Upto critical radius of insulation
- (A) added insulation will increase heat loss
 - (B) added insulation will decrease heat loss
 - (C) convection heat loss will be less than conduction heat loss
 - (D) heat flux will decrease
18. The ratio of energy transferred by convection to that by conduction is called
- (A) Stanton number
 - (B) Nusselt number
 - (C) Biot number
 - (D) Prandtl number
19. A body, whose absorptivity does not vary with temperature and wave length of the incident ray, is known as a
- (A) black body
 - (B) white body
 - (C) grey body
 - (D) opaque body
20. Automobile radiator is a heat exchanger of
- (A) Counter flow type
 - (B) Parallel flow type
 - (C) Cross flow type
 - (D) Regenerator type
21. Ability of material to resist fracture due to high impact load is called
- (A) toughness
 - (B) stiffness
 - (C) plasticity
 - (D) hardness
22. Amount of external energy required to deform an elastic body is called
- (A) elastic energy
 - (B) plastic energy
 - (C) strain energy
 - (D) none of these

23. Cast iron contains carbon approximately
- (A) 0.2 to 0.4%
 - (B) 1 to 1.3%
 - (C) 2 to 4%
 - (D) none of these
24. Wrought iron is
- (A) least resistant to corrosion
 - (B) highly resistant to corrosion
 - (C) soft
 - (D) hard
25. Process of austempering results in the formation of
- (A) martensitic structure
 - (B) pearlite structure
 - (C) bainite structure
 - (D) toorsite structure
26. In heat treatment process, to obtain certain desirable properties
- (A) heating of metal is done only in a solid state
 - (B) cooling of metal is done only in a solid state
 - (C) heating or cooling of metal is done in a solid state
 - (D) none of these
27. Temperature at which the change starts on heating the steel, is called
- (A) lower critical temperature
 - (B) upper critical temperature
 - (C) point of recalescence
 - (D) none of these
28. In iron - carbon diagram, the abscissae is
- (A) carbon percentage
 - (B) temperature
 - (C) time
 - (D) none of these
29. In a unit cell of body centered cubic space lattice, total number of atoms is
- (A) 6
 - (B) 9
 - (C) 14
 - (D) 24
30. Solder is an alloy of
- (A) copper and tin
 - (B) lead and tin
 - (C) lead and copper
 - (D) aluminium and copper

31. Accuracy of measuring equipment is
- (A) the closeness with which a measurement can be read directly from a measuring instrument
 - (B) a measure of how close the reading is to the true size
 - (C) the difference between measured value and actual value
 - (D) the smallest change that can be measured.
32. Use of CIM technology offers a layout architecture where computation takes place
- (A) using online information
 - (B) using virtual memory
 - (C) using online information and multi-processing
 - (D) none of these
33. The quality model of forecasting based on the consensus of a panel of experts is called
- (A) Composite Sales Team Method
 - (B) Exponential Smoothing Method
 - (C) Regression Method
 - (D) Delphi Method
34. A decision making process to determine when a job is to be started in a machine and when it is to be completed, is
- (A) scheduling
 - (B) routing
 - (C) master scheduling
 - (D) aggregate planning
35. Kanban is Japanese term indicating
- (A) a method of line balancing
 - (B) information for production and withdrawal of items
 - (C) priority dispatching
 - (D) line-time employment
36. The method of classification of items to be adopted for spare parts inventory is
- (A) ABC analysis
 - (B) XYZ analysis
 - (C) VED analysis
 - (D) SDE analysis

37. The two-bin system is concerned with

- (A) ordering procedure
- (B) forecasting sales
- (C) production planning
- (D) none of these

38. Mean rate of consumption during lead time (R) multiplied by mean lead time (L) is equal to

- (A) buffer stock
- (B) reserve stock
- (C) safety stock
- (D) none of these

39. Critical activities are those for which

- (A) float = 0
- (B) float = +1
- (C) float < 1
- (D) float > 1

40. CPM has

- (A) one-time estimate
- (B) two-times estimate
- (C) three-times estimate
- (D) four-times estimate.

SECTION - B

Answer *all* questions.

Each question carries six marks.

15×6=90

1. What is meant by quasi-static process ?
2. Explain, how the zeroth law of thermodynamics can be used for temperature measurement
3. Explain polytropic process.
4. Show the equivalence of two statements of 2nd law of thermodynamics.
5. Explain the entropy principle.
6. Define 'available energy' and 'unavailable energy'.

7. What is meant by mollier diagram ? Explain.
8. Why Carnot refrigerator can not be used in practice ?
9. Describe Atomic Packing Factor (APF).
10. Compare between Normalizing and Annealing.
11. Enlist the required properties for bearing material.
12. What are the differences between CPM and PERT ?
13. Explain Economic Order Quantity (EOQ).
14. What are the objectives of JUST IN TIME (JIT) system ?
15. What are the differences between forecasting and prediction ?

SECTION – C

Answer *all* questions.

Each question carries six marks.

5×6=30

1. A refrigerator operates on reversed Carnot cycle. Determine the power required to drive refrigerator between temperatures of 42°C and 4°C if heat at the rate of 2KJ/s is extracted from the low temperature region.
2. Determine the change in entropy of 0.5 kg of air compressed polytropically from 1.013×10^5 Pa to 0.8 MPa and 800 K following index 1.2. Take $C_v = 0.71$ kJ / kg. k.

3. The engine oil at 150°C is cooled to 80°C in a parallel flow heat exchanger by water entering at 25°C and leaving at 60°C . Determine the heat exchanger effectiveness.
4. A casting of size $100\text{ cm} \times 100\text{ cm} \times 25\text{ cm}$ was filled by top and bottom gates with manometric height in pouring basin to be 25 cm . Compare the time to fill the casting by different gates. The area of gate is 5 cm^2 .
5. The actual demand for a manufactured item for the past 10 months have been as 100, 100, 110, 120, 130, 140, 130, 140 150 and 160 units. What is the predicted demand for the 11th month based on 3 month and 5 month moving average ?