DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

Booklet Serial No. **002053**

TEST BOOKLET - 2022
AUTOMOBILE ENGINEERING
LECTURER I
(12)

A

Time Allowed: Two Hours   **Maximum Marks: 100**

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 A COMPLETE TEST BOOKLET.

2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Response Sheet. Any omission/discrepany will render the Response Sheet liable for rejection.**

3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. **DO NOT** write **anything else** on the Test Booklet.

4. This Test booklet contains **100** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Response sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.

5. You have to mark all your responses **ONLY** on the separate Response Sheet provided. See directions in the Response Sheet.

6. All items carry equal marks.

7. Before you proceed to mark in the Response sheet the response to various items in the Test Booklet you have to fill in some particulars in the Response Sheet as per instructions sent to you with your Admission Certificate.

8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator *only the Response Sheet*. You are permitted to take away with you the Test Booklet and Candidate's Copy of the Response Sheet.

9. Sheets for rough work are appended in the Test Booklet at the end.

10. **Penalty for wrong answers:**
    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE.
    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **0.25** of the marks assigned to that question will be deducted as penalty.
    (ii) It a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.
    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be no **penalty** for that question.

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1. According to the Gay-Lussac law for a perfect gas, the absolute pressure of a given mass varies directly as

   A) Temperature

   B) Remains constant, if volume and temperature are kept constant

   C) Volume if the temperature is kept constant

   D) Absolute temperature, if Volume is kept constant

2. General Gas Equation is

   A) $PV = nRT$

   B) $PV = mRT$

   C) $PV = C$

   D) $PV = KiRT$

3. A device used to heat feed water by utilizing the heat in the exhaust flue gases before leaving through the chimney is called as

   A) superheater

   B) economiser

   C) blow of cock

   D) stop valve

4. The amount of water evaporated in kg per kg of fuel burnt is called

   A) equivalent evaporation

   B) boiler efficiency

   C) evaporative capacity

   D) distillation capacity

5. Air is expanded reversibly and adiabatically in a turbine from 3.5 bar and 260°C to 1 bar. The turbine is insulated and the inlet velocity is negligible. The exit velocity is 150 m/s. Then the work output of the turbine per unit mass of airflow is

   A) 1.55 kJ/kg

   B) 15.5 kJ/kg

   C) 0.15 kJ/kg

   D) 155.5 kJ/kg

6. A regenerative steam cycle renders
   1) decreased work output per unit mass of steam as well as increased thermal efficiency
   2) increased thermal efficiency
   3) decreased work output per unit mass of steam
   4) increased work output per unit mass of steam
   A) 1 alone
   B) 1, 2, 3 and 4 alone
   C) 2 and 3 alone
   D) 4 alone

7. The throttling process is
   A) Steady Flow Process
   B) Non-steady Flow Process
   C) Steady non Flow Process
   D) Non-steady non-flow process

8. Which one of the following is not the property of thermodynamics?
   A) Pressure
   B) Heat
   C) Temperature
   D) Specific Volume

9. The second law of thermodynamics emphasis
   A) Work
   B) Pressure
   C) Energy
   D) Entropy

10. An adiabatic process is one in which
    1) no heat enters or leaves the gas
    2) the temperature of the gas changes
    3) the change in the internal energy is equal to the mechanical work done
    A) 1 and 2
    B) 2 and 3
    C) 1, 2 and 3
    D) 1 and 3

11. Gas at 1.5 bar and 295 K in a closed vessel is compressed to 10 bar. Its temperature becomes 455 K.

If the compression is $pv^n = C$. Then the value of n

A) 0.13

B) 1.3

C) 0.013

D) 13

12. One kg of air is heated at a constant volume from 1 bar 27°C to a pressure of 5 bar. Calculate the change of entropy when R = 286 J/kg K and c_v = 0.712kJ/kg K

A) 1.145 kJ/K

B) 11.45 kJ/K.

C) 111.45 kJ/K

D) 1111.45 kJ/K

13. Which of the following is the lightest and most volatile liquid fuel?

1) Gasoline

2) Kerosene

3) Fuel Oil

A) 1, 2 and 3

B) 1 and 2

C) 2 and 3

D) 1 alone

14. The velocity of molecules

A) remain constant at all temperatures

B) decrease with the increase of temperature

C) increase with the decrease of temperature

D) increase with the increase of temperature

15. The pressure exerted by an ideal gas is

A) one – half of the kinetic energy

B) one – third of the kinetic energy

C) two – thirds of the kinetic energy

D) three – fourth of the kinetic energy

16. An air standard diesel cycle has a compression ratio of 14. The pressure at the beginning of the compression stroke is 1 bar and the temperature is 27°C. The maximum temperature of the cycle is 2500°C. What is the efficiency of the engine?

   A) 23.6%
   B) 64.2%
   C) 59.1%
   D) 53.6%

17. What is the loss in air standard efficiency for an engine with a compression ratio of 15 and the cut-off changes from 5 to 15% of the stroke

   A) 6.0%
   B) 6.3%
   C) 6.6%
   D) 6.5%

18. The entropy _____ is an irreversible cyclic process.

   1) constant process
   2) decrease process
   3) increase process
   A) 1 alone
   B) 1 and 2
   C) 1 and 3
   D) 1, 2 and 3

19. 5 Kg of steam at a pressure of 5 bar is produced from water at 20°C. What is the amount of heat supplied if the steam is 0.9 dry

   A) 1.2265 kJ
   B) 12.265 kJ
   C) 122.265 kJ
   D) 0.122 kJ

20. The latent heat of steam at atmospheric pressure is

   A) 2257 kJ/kg
   B) 2685 kJ/kg
   C) 1541 kJ/kg
   D) 1875 kJ/kg

21. The amount of heat absorbed to evaporate 1 kg of water from its saturation temperature without change of temperature is called
    A)   sensible heat of water
    B)   latent heat of vaporisation
    C)   enthalpy of steam
    D)   entropy of steam

22. Which of the following is correct?
    A)   Absolute pressure = Gauge pressure + Atmospheric pressure
    B)   Gauge pressure = Absolute pressure + Atmospheric pressure
    C)   Atmospheric pressure = Absolute pressure + Gauge pressure
    D)   Absolute pressure = Gauge pressure - Atmospheric pressure

23. Dry saturated steam at 7 bar is expanded is entropically to 4 bar after which it is condensed at a constant volume to 1 bar. What is the final dryness fraction of the steam
    A)   0.13
    B)   0.39
    C)   0.52
    D)   0.26

24. The distillation is carried out in such a way that the liquid with the lowest boiling point is first evaporated and recondensed, then the liquid with the next higher boiling point is then evaporated and recondensed, and so on until all the available liquid fuels are separately recovered in the sequence of their boiling points. Such a process is called
    1)   distillation
    2)   fractional distillation
    3)   full distillation
    A)   1 alone
    B)   1 and 2
    C)   2 alone
    D)   3 alone

25. A simple Rankine cycle uses steam as the working medium and operated between 0.5 bar and 20 bar. If the steam entering the turbine is dry at 20 bar what will be the quality of steam as it leaves the turbine
    A)   0.816
    B)   0.618
    C)   0.168
    D)   0.316

26. The fuel mostly used in boilers is
    A) non – caking bituminous coal
    B) peat
    C) brown coal
    D) caking bituminous coal

27. Petrol is distilled at
    A) 470° to 550°C
    B) 345° to 470°C
    C) 220° to 345°C
    D) 65° to 220°C

28. One kg of ethylene requires 2 kg of oxygen and produces 22/7 kg of carbon dioxide
    A) 9/7 kg of water
    B) 11/7 kg of water
    C) 11/4 kg of water
    D) 7/4 kg of water

29. The locomotive boiler has
    A) 137 fire tubes and 24 superheated tubes
    B) 147 fire tubes and 34 superheated tubes
    C) 157 fire tubes and 24 superheated tubes
    D) 167 fire tubes and 14 superheated tubes

30. Which of the following statement is incorrect?
    1) liquid fuels consist of hydrocarbons.
    2) liquid fuels have a higher calorific value than solid fuels.
    3) solid fuels have a higher calorific value than liquid fuels.
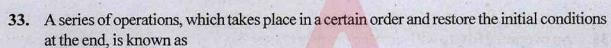   4) good fuel should have a low ignition point.
    A) 3 alone
    B) 1, 2, 3 and 4
    C) 2 and 3
    D) 2 alone

31. Determine the draught in mm of water column produced by a chimney 36 m high when the mean temperature of hot gases is 300°C, the temperature of outside air is 27°C and 19 kg of air is supplied per kg of fuel burnt in the furnace
   A) 190 mm
   B) 0.19 mm
   C) 1.9 mm
   D) 19 mm

32. In a gas turbine plant, operating on the Brayton cycle air enters the compressor at 1 bar and 27°C. The pressure ratio in the cycle is 6. What is the maximum temperature in the cycle and the power developed by the turbine if the turbine work as 2.5 times the compressor work if $\lambda = 1.4$
   A) 703.5 kW
   B) 7035 kW
   C) 70.35 kW
   D) 713.5 kW

33. A series of operations, which takes place in a certain order and restore the initial conditions at the end, is known as
   1) Reversible cycle
   2) Irreversible cycle
   3) Thermodynamic cycle
   A) 1 alone
   B) 3 alone
   C) 1 and 3
   D) 2 and 3

34. The gas in the cooling chamber of a closed cycle gas turbine is cooled at
   A) constant pressure
   B) constant temperature
   C) constant volume
   D) constant density

35. The high air-fuel ratio is gas turbines
   A) increases power output
   B) improves thermal efficiency
   C) do not damage turbine blades
   D) reduces exhaust temperature

36. The wheelbase of the vehicle is

    A)   Distance between the centres of the front and rear Wheels

    B)   Distance between the centres of the front tyres

    C)   Extreme length of the vehicle

    D)   Distance between the centres of the rear tyres

37. According to Avogadro's law

    1)   The product of the gas constant and the molecular mass of an ideal gas is constant

    2)   equal volumes of all gases, at the same temperature and pressure, contain an equal number of molecules

    A)   1 alone

    B)   2 alone

    C)   1 and 2

    D)   none of the above

38. An overinflated tyre will wear the tread most near the

    A)   Centre   B)   Edges

    C)   Corners   D)   near the edges

39. The seat belt tensioners are built in the

    A)   Front seats

    B)   Seat belt retractors

    C)   Shoulder anchors

    D)   Seat belt buckles

40. The oil pump is driven by the

    1)   Alternator shaft

    2)   Camshaft

    3)   Crankshaft

    4)   Auto shaft

    A)   1, 2 and 3

    B)   2 and 3

    C)   3

    D)   1, 2, 3 and 4

41. The natural gas is compressed in a CNG cylinder at a pressure of

    A)   200 bar

    B)   220 bar

    C)   250 bar

    D)   280 bar

42. The damper is used in the automobile to

    1)   absorb the energy

    2)   release the energy

    3)   dissipate the energy

    A)   1 and 2

    B)   2 and 3

    C)   3 only

    D)   1 and 3

43. What type of bearing is used for main bearings and connecting rod bearings

    A)   Plain bearings

    B)   Ball bearings

    C)   Needle roller bearings

    D)   Taper roller bearing

44. The main basis for the change in the viscosity of the engine oil is due to

    A)   Contamination

    B)   Temperature

    C)   Humidity

    D)   Vibration

45. Petrol that detonates easily is called

    A)   High octane petrol

    B)   Blended petrol

    C)   Unleaded petrol

    D)   Low Octane petrol

46. The device for smoothening out the power impulses from the engine is termed as

    A) Differential

    B) Torque converter

    C) Clutch

    D) Flywheel

47. In automobiles, G.V.W. refers to

    A) Gross vehicle weight

    B) Gross vehicle wheelbase

    C) Gross vehicle wheel track

    D) Gross vehicle width

48. The coefficient of friction for the clutch facing is approximately

    A) 0.8

    B) 0.4

    C) 0.1

    D) 0.5

49. In the case of a Diesel car, the pressure at the end of compression is of the order of

    A) 45 bar

    B) 15 bar

    C) 25 bar

    D) 35 bar

50. The rod that connects the piston is

    A) Rod cap

    B) Cap roller bearing

    C) Piston pin

    D) Cap bolt

51. Clutch facings are usually attached to the plate by
    A) Steel rivets
    B) Aluminium rivets
    C) Iron rivets
    D) Brass rivets

52. The two kinds of piston rings are
    A) Pressure and sealing rings
    B) Compression and oil control rings
    C) Compression and sliding seal rings
    D) Oil scrapper and oil control rings

53. The Tandem master cylinder consists of
    A) Two cylinders and two reservoirs
    B) One cylinder and two reservoirs
    C) Two cylinders and one reservoir
    D) One cylinder and one reservoir

54. The torque capacity (Mt) of the disk brake is given by
    A) μPRf B) μ/PRf
    C) $\mu P/Rf$ D) $\mu PR/f$

55. When the intensity of the pressure between the block and the brake drum is uniform, the angle of contact between the block and brake drum is less than
    A) 90°   B) 60°
    C) 30°   D) 45°

56. The specific heat at constant volume is
    1) the amount of heat required to raise the temperature of a unit mass of gas by one degree, at constant pressure
    2) the amount of heat required to raise the temperature of a unit mass of gas by one degree, at a constant volume
    3) the amount of heat required to raise the temperature of 1 kg of water by one degree
    A) 1 and 2
    B) 2 and 3
    C) 2 alone
    D) 3 alone

57. The following is not a friction clutch

   A)   Disc clutch

   B)   Centrifugal clutch

   C)   Cone clutch

   D)   Fluid clutch

58. Electric vehicles are generally powered by

   A)   Lead-acid batteries

   B)   Aluminium batteries

   C)   Sodium batteries

   D)   Magnesium batteries

59. The abbreviated form of ICEV is

   A)   Inter combustion engine vehicles

   B)   Internal combustion engine vehicles

   C)   Internally combined engine vehicles

   D)   Indigenous combined engine vehicles

60. What is the cause of low pressure in the hydraulic power steering system?

   A)   Worn out sealing ring

   B)   Air in the system

   C)   Low oil level

   D)   Wrong flow control valve setting

61. What is the cause of the Wheel wobbling?

   A)   Kingpin wornout

   B)   Improper tyre pressure

   C)   Drop in pressure

   D)   Wrong hose size

62. The steering ratio is defined as the ratio of

A) number of degrees that the steering wheel turns to the number of degrees of wheel turn Medullary rays

B) number of degrees that the wheel turns to the number degrees of the steering wheel turn

C) number of degrees that the steering gear turns to the number of degrees of wheel turn

D) number of degrees that the wheel turns to the number degrees of the steering gear turn

63. An isothermal process is

1) there is no change in temperature

2) there is no change in enthalpy

3) there is no change in internal energy

A) 1 and 2

B) 1 and 3

C) 2 and 3

D) 1, 2 and 3

64. The elastic stress-strain behaviour of rubber is

A) Nonlinear

B) Linear

C) Plastic

D) No fixed relationship

65. The property of metal by which it can be drawn into wires is termed as

A) malleability

B) viscosity

C) ductility

D) tensility

66. The reaction in which a liquid phase transforms into two different solid phases is called
    A) Eutectic reaction
    B) Eutectoid reaction
    C) Peritectic reaction
    D) Peritectoid reaction

67. Dislocations in materials are
    A) Point defect
    B) Surface defect
    C) Planer defect
    D) Line defect

68. The Cast Iron which has all the carbon in the combined form as cementite is called as
    A) White cast iron
    B) Spheroidal cast iron
    C) Malleable cast iron
    D) Grey cast iron

69. Which is the primary element used for making stainless steel alloy
    A) Vanadium
    B) Indium
    C) Chromium
    D) Zirconium

70. When gas is heated changes take place in
    1) Pressure
    2) Volume
    3) Temperature
    A) 1 and 2
    B) 1 and 3
    C) 1, 2 and 3
    D) 2 and 3

71. The maximum internal diameter of a blast furnace is about

    A) 3 m

    B) 6 m

    C) 12 m

    D) 9 m

72. Nickel when added to copper improves

    A) Hardness

    B) Strength

    C) Ductility

    D) Machinability

73. Which brass alloy is suitable for high-speed machining?

    A) Leaded brass

    B) Muntz brass

    C) High tensile brass

    D) Gliding brass

74. Magnalium is an alloy of Magnesium and

    A) Zinc and Tin

    B) Zirconium and Zinc

    C) Nickel and Zinc

    D) Nickel and Tin

75. The cupola is used to manufacture

    A) Cast iron

    B) Pig iron

    C) Wrought iron

    D) Steel

76. Smelting is the process of

A) Reducing the ore with carbon in the presence of a flux

B) Removing the impurities like clay, sand etc. from the iron ore by washing with water

C) Expelling moisture, carbon dioxide, sulphur and arsenic from the iron ore by heating it in shallow kilns

D) Removing the ores and washing with water

77. Duralumin contains

A) 94% aluminium, 4% copper and 0.5% Mn, Mg, Si and Fe

B) 92.5% aluminium, 40% copper, 2% nickel, and 1.5% Mg Teak

C) 10% aluminium and 90% copper

D) 90% magnesium and 9% aluminium with some copper

78. The condition for the reversibility of a cycle is

1) the pressure and temperature of the working substance must not differ, appreciably, from those of the surroundings at any stage in the process

2) all the processes, taking place in the cycle of operation, must be extremely slow

3) the working parts of the engine must be friction-free

A) 1 and 2

B) 2 and 3

C) 1 and 3

D) 1, 2 and 3

79. The melting point of iron is

A) 1601°C

B) 1489°C

C) 1539°C

D) 1712°C

80. In open cycle gas turbine plants

1) the indirect heat exchanger and cooler are avoided

2) direct combustion system is used

3) a condenser is used

A) 1 and 2

B) 1 and 3

C) 2 and 3

D) 1, 2 and 3

81. Ball bearing is usually made from
    A) Low carbon steel
    B) High carbon steel
    C) Chrome steel
    D) Medium carbon steel

82. Quenching is not needed when hardening is made by
    A) Nitriding
    B) Flame hardening
    C) Case hardening
    D) Gas welding

83. Malleable cast iron is produced
    1) by adding magnesium to molten cast iron
    2) by quick cooling of molten cast iron
    3) from white cast iron by the annealing process
    A) 1 and 2   B) 1 and 3
    C) 2 and 3   D) 1, 2 and 3

84. The material used for making pendulums of the clock are
    A) Stainless steel   B) Nickel steel
    C) High-speed steel   D) Heat resisting steel

85. The depth of hardness of steel is increased by adding
    A) Chromium
    B) Tungsten
    C) Vanadium
    D) Nickel

86. A material is said to be allotropic if it has
    1) fixed structure at all temperatures
    2) atoms distributed in a random pattern
    3) different crystal structures at different temperatures
    A) 3   B) 1, 2 and 3
    C) 2 and 3   D) 1 and 3

87. The difference in pressure between the inside and outside of liquid drop is

    A) $p = 2T/r$

    B) $p = T/2r$

    C) $p = T/r$

    D) $p = T \times r$

88. Intermolecular cohesive force in the fluid is
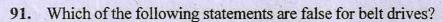
    A)   unpredictable

    B)   Equal to that of solids

    C)   More than that of solids

    D)   Less than that of solids

89. With respect to Joule's law, the internal energy of perfect gas is the function of absolute

    A)   Volume

    B)   Temperature

    C)   Density

    D)   Pressure

90. Which is the best source of power transmission

    A)   Brake shoes

    B)   Nuts and bolts

    C)   Sprockets and Chains

    D)   Axles

91. Which of the following statements are false for belt drives?

    1)   The belt drive is used in applications having a constant speed drive

    2)   Belt drives can be used at extremely high speeds

    3)   Belt drives have low power transmitting capacity

    4)   Belt drives need continuous lubrication

    A)   1 and 2

    B)   1, 2 and 3

    C)   2, 3 and 4

    D)   1, 2 and 4

92. The objective of considering ergonomics in machine design is to

    1) Decrease physical stresses

    2) Make the user adapt to the machine

    3) Make the machine fit the user

    4) Improves the appearance of the product

    A) only 2

    B) 1 and 3

    C) 3 and 4

    D) 1, 3 and 4

93. In the process of designing the process which is followed after selecting the material?

    A) Synthesis

    B) Analysis of forces

    C) Selecting factors for safety

    D) Determining the mode of failure

94. For pipes, laminar flow occurs when the Reynolds number is

    A) Less than 4000

    B) More than 4000

    C) Between 2000 to 4000

    D) Less than 2000

95. The fumigation technique was used to control

    A) smoke

    B) CO

    C) NOx

    D) HC

96. When the steel is normalized its
   1) Yield point increases
   2) ductility decreases
   3) Ultimate tensile strength increases
   A) 1, 2 and 3
   B) 1
   C) 2 and 3
   D) 1 and 3

97. An engine produces 10 kW brake power while working with a brake thermal efficiency of 30% if the calorific value of the fuel used is 4000 kJ/Kg what is the fuel consumed
   A) 1.5 $^{kg/hr}$
   B) 3 $^{kg/hr}$
   C) 0.3 $^{kg/hr}$
   D) 1 $^{kg/hr}$

98. As per BS-VI, which are the emissions standards for four-wheel diesel motor vehicles?
   A) $0.0045^{g/km}$ PM and $0.060^{g/km}$ NO_x
   B) $0.005^{g/km}$ PM and $0.76^{g/km}$ NO_x
   C) $0.085^{g/km}$ PM and $0.56^{g/km}$ NO_x
   D) $0.005^{g/km}$ PM and $0.60^{g/km}$ NO_x

99. In a variable speed S.I. engine, the maximum torque occurs at the maximum
   A) speed
   B) indicated power
   C) brake power
   D) volumetric efficiency

100. The test used for determining the indicated power of a multi-cylinder SI engine is
   A) Prony brake test
   B) Motoring test
   C) Heat balance test
   D) Morse test

ROUGH WORK

ROUGH WORK