DO NOT OPEN THE SEAL UNTIL INSTRUCTED TO DO SO

Question Booklet No.

QUESTION BOOKLET

AUTOMOBILE ENGINEERING

Booklet Series

A

Roll No. | | | | | |

(Enter your Roll number in the above space)

Time Allowed : 2 Hours **Maximum Marks : 100**

INSTRUCTIONS FOR CANDIDATES

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS QUESTION BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR QUESTIONS ETC. IF SO, GET IT REPLACED BY A COMPLETE QUESTION BOOKLET.
2. Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Question Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the OMR Answer Sheet liable for rejection.
3. This Question Booklet contains **100** questions. Each question is printed in **English** only. Each question comprises four responses (answers). You will select the response which you want to mark on the OMR Answer 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 question.
4. You have to mark all your responses **ONLY** on the separate OMR Answer Sheet provided. See Instructions at the backside of the OMR Answer Sheet.
5. **All** questions carry equal marks.
6. Before you proceed to mark in the OMR Answer Sheet the response to various questions in the Question Booklet, you have to fill in some particulars in the OMR Answer Sheet as per instructions mentioned on the OMR Answer Sheet.
7. After you have completed filling in all your responses on the OMR Answer Sheet and the examination has concluded, you should hand over to the Invigilator **only the OMR Answer Sheet**. You are permitted to take away with you the **Question Booklet**, along with candidate's copy of **OMR Answer Sheet**.
8. Sheets for rough work are appended in the Question Booklet at the end.
9. **Penalty for wrong answers :**

   THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE AS UNDER.

   (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 mark** assigned to that question will be deducted as penalty.

   (ii) If 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 to 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.

DO NOT OPEN THE SEAL UNTIL INSTRUCTED TO DO SO

Test Prime

ALL EXAMS, ONE SUBSCRIPTION

50,000+
Mock Tests

Personalised Report Card

Unlimited Re-Attempt

500+
Exam Covered

Previous Year Papers

500%
Refund

IBPS · NABARD · INDIAN RAILWAYS

ATTEMPT FREE MOCK NOW

1. In automobile crankcase, oil viscosity changes during the operation due to

[A] contamination

[B] temperature

[C] high speed

[D] vibration

2. In automobile, if four-stroke diesel engine is running at 1000 r.p.m., then camshaft will rotate at

[A] 2000 r.p.m.

[B] 1000 r.p.m.

[C] 500 r.p.m.

[D] 250 r.p.m.

3. In automobile, to enhance the cooling property of water, antifreeze solution is mixed with

[A] methylene glycol

[B] ethylene glycol

[C] benzene

[D] glycerin

4. The Pitman arm steering system facilitates mechanical advantage by using

[A] spur gear

[B] helical gear

[C] bevel gear

[D] worm gear

5. When viewed from the front, excessive wear on one side of the tyre is due to

[A] incorrect toe

[B] excessive caster angle

[C] excessive camber angle

[D] underinflation

6. In an automobile, a higher tyre aspect ratio results in

[A] better ride comfort and better handling performance

[B] decrease in ride comfort and handling performance

[C] decrease in ride comfort but better handling performance

[D] reducing handling performance but better ride comfort

7. In a vehicle, lateral swaying of the vehicle is prevented by which of the following components of suspension system?

[A] Damper

[B] Spring

[C] Linkage

[D] Stabilizer

8. Central differential gear system is used in case of

[A] four-wheel drive

[B] three-wheel drive

[C] two-wheel drive

[D] single-wheel drive

9. In braking system of vehicle, brake fluid is used for

[A] power transmission

[B] lubrication

[C] cooling

[D] emergency services

10. In lead-acid battery, positive plates are made up of

[A] lead sulphate ($PbSO_4$)

[B] sulphuric acid (H_2SO_4)

[C] lead peroxide (PbO_2)

[D] spongy lead (Pb)

11. In case of half-charged battery, the specific gravity of acid will be

[A] 1·00

[B] 1·13

[C] 1·17

[D] 1·19

12. To improve the anti-knocking property of diesel, additive mixed with the fuel is

[A] tetraethyllead

[B] trimethylpentane

[C] amyl nitrate

[D] hexadecane

13. For the balancing of vehicle in four-cylinder engine, firing order is set as

[A] 4-3-1-2

[B] 1-2-3-4

[C] 1-3-2-4

[D] 1-4-3-2

14. To control the NO_x emission from the vehicle, a specific catalytic converter uses

[A] platinum

[B] palladium

[C] rhodium

[D] zirconium

15. In a spark ignition engine, detonation occurs frequently in case, when petrol has/is

[A] high octane number

[B] low octane number

[C] blended

[D] unleaded

16. In a four-stroke cycle engine, the four operations namely suction, compression, expansion and exhaust are completed where the number of revolutions of the crankshaft is equal to

[A] four

[B] two

[C] three

[D] one

17. Which of the following is a CI engine?

[A] Diesel engine

[B] Petrol engine

[C] Gas engine

[D] Rotary engine

18. The two-stroke cycle engine has

[A] one suction valve and one exhaust valve operated by one cam

[B] one suction valve and one exhaust valve operated by two cams

[C] only ports covered and uncovered by the piston to effect charging and exhausting

[D] Cam has no relation to port operation

19. For the same output, same speed and same compression ratio, the thermal efficiency of a two-stroke cycle petrol engine, as compared to that of a four-stroke cycle petrol engine, is

[A] more

[B] less

[C] the same as long as the compression ratio is the same

[D] the same as long as the output is the same

20. Very high compression ratios are not used with petrol engines because

[A] power required for compression becomes very high

[B] cylinder walls will have to be made thicker

[C] the resulting high temperatures would adversely affect the lubrication system

[D] self-ignition would take place before the spark occurs

21. Which of the following is the ***false*** statement about a torque converter?

[A] The blades have a curved shape

[B] The oil is driven by the impeller unit

[C] The stator unit redirects the flow of oil to the impeller

[D] Maximum torque multiplication occurs at low speed

22. The output voltage of a charger is

[A] higher than the battery voltage

[B] less than the battery voltage

[C] the same as the battery voltage

[D] No relation between them

23. Contact breaker points are generally made up of

[A] plastic

[B] steel

[C] tungsten

[D] copper

24. For a practical petrol engine working on the Otto cycle, the compression ratio usually lies in the range of

[A] 3–5

[B] 6–8

[C] 10–15

[D] 16–22

25. Which of the following aspects is ***wrong*** regarding worm and wheel type of final drive?

[A] Particularly useful in lighter vehicles where the final reduction is less than 5

[B] Quite efficient and very strong drive

[C] Higher cost and more weight than bevel gears

[D] The mechanical efficiency is lower than that of bevel gears for a single-stage final drive

26. The function of a differential gear in automobiles is to

[A] facilitate the reverse operation of the vehicle

[B] reduce tyre wear at high speeds

[C] distribute equal torque between wheels

[D] take care of the difference in speeds of rear wheels

27. The first gear ratio of the 4-speed gearbox of an automobile is 1 : 4·5 and that of the differential gear is 1 : 4. If the automobile is driven in first gear, then the ratio between the engine and the axle speed would be

[A] 1 : 1

[B] 4 : 1

[C] 4·5 : 1

[D] 18 : 1

28. Weight of the vehicle produces _____ in the side members of the vehicle frame.

[A] vertical bending

[B] horizontal bending

[C] torsion

[D] no effect

29. The purpose of tyre rotation on automobiles is to

[A] avoid ply separation

[B] equalize wear

[C] get better ride

[D] reduce running cost

30. The springs provided for the rear wheels of a tractor are

[A] leaf springs

[B] helical springs

[C] helical springs supported by leaf springs

[D] No springs are provided

31. Which one of the following is ***not*** an objective of using the suspension system?

[A] Prevent the road shocks from being transmitted to the vehicle components

[B] Safeguard the occupants from road shocks

[C] Preserve the stability of the vehicle in pitching or rolling while in motion

[D] Suspension system helps in better steering control

32. The type of spring widely used for suspension in light and heavy commercial vehicles is

[A] torsion bar

[B] semi-elliptic leaf spring

[C] tapered leaf spring

[D] coil spring

33. Circumferential grooves on automobile tyres

[A] provide good traction

[B] prevent small stones sticking to the tyre

[C] reduce the danger of skidding

[D] increase load carrying capacity

34. All of the following statements about the light-alloy cast wheel are correct, ***except***

[A] improved road adhesion especially on corners

[B] reduced weight but high cost

[C] poor dissipation of heat produced by tyres and brakes

[D] being more prone to corrosion

35. Compared to rear-wheel drive, the front-wheel drive

[A] has better riding performance

[B] has greater skidding tendency

[C] needs a longer propeller shaft

[D] has increased tractive effort when going up the steep gradient

36. Most popular manual steering gear for cars is

[A] cam and roller type

[B] worm and wheel type

[C] rack and pinion type

[D] worm and nut type

37. The mechanism which is almost universally used for steering purpose is

[A] Hart's mechanism

[B] Ackermann mechanism

[C] Scott-Russell mechanism

[D] Watt's mechanism

38. What material is a brake lining usually made up of?

[A] Asbestos

[B] Leather

[C] Cork

[D] Fabric

39. The function of the Anti-lock Brake System (ABS) is that, it

[A] reduces the stopping distance

[B] minimizes the brake fade

[C] maintains directional control during braking by preventing the wheels from locking

[D] prevents nose dives during braking and thereby postpones locking of the wheels

40. Which is ***not*** a part of the automobile transmission system?

[A] Clutch

[B] Gearbox

[C] Axles

[D] Differential gear

41. The component which constitutes a disengageable connection between the engine and transmission system of a vehicle is

[A] stub axle

[B] flywheel

[C] clutch

[D] propeller shaft

42. The pressure plate is held against the clutch plate by

[A] struts

[B] levers

[C] thrust bearings

[D] springs

43. The use of helical gears rather than spur gears in the transmission system has the advantage of

[A] quiet running

[B] economy

[C] less end thrust

[D] strength

44. Automobile engines are usually designed as multi-cylinder engines because of

[A] lower fuel consumption and high efficiency

[B] continuity of power output even if one cylinder fails

[C] uniform torque output and better balance

[D] generation of more power

45. The slotted grooves on oil rings for pistons help to

[A] seal the cylinder

[B] minimize friction

[C] prevent the piston from wear

[D] provide an escape for the oil that the slots edge out from the cylinder walls

46. Automobile connecting rods are mass-produced by

[A] cold heading

[B] forging

[C] fine sand casting

[D] die casting

47. Which is ***not*** a material for automobile pistons?

[A] Aluminium alloys

[B] Cast iron

[C] Cast steel

[D] Steel forgings

48. The top of the piston in a two-stroke engine is

[A] flat

[B] slanted

[C] crown shaped

[D] convex shaped

49. Scavenging air means

[A] air sent under compression

[B] air used for forcing the burnt gases out of the cylinder during the exhaust period

[C] forced air for cooling the engine cylinder

[D] burnt air containing combustion products

50. Which of the following is ***not*** a correct match?

[A] Air cleaner : prevents dust and other foreign matter from entering the engine

[B] Exhaust muffler : reduces the exhaust noise

[C] Intake manifold : distributes intake air equally to the cylinders

[D] Resonator : regulates the intake air flow rate

51. Which of the following ***do not*** relate to a diesel engine?

[A] Fuel pump and fuel injector

[B] Airless or solid injector system

[C] Governor and flywheel

[D] Ignition coil and distributor unit

52. The type of glass often used in automobiles is

[A] fiber glass

[B] triplex glass

[C] crown glass

[D] plate glass

53. The exhaust pipes of engines is covered with insulating material to

[A] conserve heat

[B] keep the exhaust pipes warm

[C] reduce heat transfer to the engine room

[D] increase the engine efficiency

54. In automobiles, one of the major pollutants emitted from the exhaust pipe due to incomplete combustion is

[A] CO

[B] H_2O

[C] N_2

[D] CFC

55. For machining a complex contour on tungsten carbide workpiece, the manufacturing process used is

[A] ECM

[B] EDM

[C] USM

[D] Turning

56. CNC machines are used because they

[A] are more accurate than conventional machines and they have a high resolution encoder and digital readouts for positioning

[B] are more economical to use even for simple turning jobs

[C] are of very low cost as compared to conventional machine

[D] are highly productive and less costly

57. The DC power source for arc welding has the characteristics $2V + I = 200$, where V = voltage and I = current in amp. For maximum arc power at the electrode, voltage should be set at

[A] 30 V

[B] 50 V

[C] 70 V

[D] 90 V

58. Which one among the following welding processes uses non-consumable electrode?

[A] Gas metal arc welding

[B] Submerged arc welding

[C] Gas tungsten arc welding

[D] Flux coated arc welding

59. In forming, like wire drawing operation, the work material should essentially be

[A] ductile

[B] tough

[C] hard

[D] malleable

60. Hot chamber die casting is ***not*** suitable for

[A] lead and its alloys

[B] zinc and its alloys

[C] tin and its alloys

[D] copper and its alloys

61. Heat and work are

[A] intensive properties

[B] extensive properties

[C] point functions

[D] path functions

62. The first law of thermodynamics takes the form $W = -\Delta H$, when applied to

[A] a closed system undergoing a reversible adiabatic process

[B] an open system undergoing an adiabatic process with negligible changes in kinetic and potential energies

[C] a closed system undergoing a reversible constant volume process

[D] a closed system undergoing a reversible constant pressure process

63. For an air-standard diesel cycle, heat addition is at constant

[A] volume and heat rejection is at constant volume

[B] pressure and heat rejection is at constant volume

[C] pressure and heat rejection is at constant pressure

[D] volume and heat rejection is at constant pressure

64. In the window air conditioner, the expansion device used is

[A] capillary tube

[B] thermostatic expansion valve

[C] automatic expansion valve

[D] float valve

65. The use of refrigerant R-22 for temperature below –30 °C is ***not*** recommended due to its

[A] good miscibility with lubricating oil

[B] poor miscibility with lubricating oil

[C] low evaporating temperature

[D] high compressor discharge temperature

66. Heat transfer takes place according to

[A] zeroth law of thermodynamics

[B] first law of thermodynamics

[C] second law of thermodynamics

[D] third law of thermodynamics

67. When the convective heat transfer coefficient $h = mk$, where $m = \sqrt{\frac{hP}{kA}}$ (A = surface area and P = perimeter), the incorporation of an extended surface will

[A] increase the rate of heat transfer

[B] decrease the rate of heat transfer

[C] not alter the rate of heat transfer

[D] only increase the rate of heat transfer when the length of the fin is very large

68. A fluid is one which can be defined as a substance that

[A] has the same shear stress at all points

[B] can deform indefinitely under the action of the smallest shear force

[C] has the small shear stress in all directions

[D] is practically incompressible

69. A static fluid can have

[A] non-zero normal and shear stress

[B] negative normal stress and zero shear stress

[C] positive normal stress and zero shear stress

[D] zero normal stress and non-zero shear stress

70. A venturimeter of 20 mm throat diameter is used to measure the velocity of a fluid flow in a horizontal pipe of 40 mm diameter. If the pressure difference between the pipe and the throat sections is found to be 30 kPa, then neglecting frictional losses, the flow velocity of fluid is

[A] 0·2 m/s

[B] 1·0 m/s

[C] 1·4 m/s

[D] 2·0 m/s

71. Two pipes of uniform section but different diameters carry water at the same flow rate. Water properties are the same in the two pipes. The Reynolds number, based on the pipe diameter, is

[A] the same in both the pipes

[B] large in the narrow pipe

[C] smaller in the narrower pipe

[D] dependent on the pipe material

72. A model of a hydraulic machine (consider as hydraulic turbine) is tested at a head $\frac{1}{4}$th of that under which the full scale machine works. The diameter of the model is half that of the full scale machine. If N is the r.p.m. of the full scale machine, then the r.p.m. of the model will be

[A] $\frac{N}{4}$

[B] $\frac{N}{2}$

[C] N

[D] $2N$

73. Consider fully developed flow through a circular pipe with negligible entrance length effects. Assuming the mass flow rate, density and friction factor to be constant, if the length of the pipe is doubled and the diameter is halved, then the head loss due to friction will increase by a factor of

[A] 4

[B] 16

[C] 32

[D] 64

74. The buckling load in a steel column is

[A] related to the length

[B] directly proportional to the slenderness ratio

[C] inversely proportional to the slenderness ratio

[D] non-linearly related to the slenderness ratio

75. The shape of the bending moment diagram for a uniform cantilever beam carrying a uniformly distributed load over its length is

[A] a straight line

[B] a hyperbola

[C] an ellipse

[D] a parabola

76. A circular beam of length 0·75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0·25 m from one end. Assume E = 200 GN/m^2 and beam diameter = 0·05 m. The static deflection at the load point will be

[A] $0{\cdot}1 \times 10^{-3}$ m

[B] $0{\cdot}1 \times 10^{-4}$ m

[C] $1{\cdot}04 \times 10^{-4}$ m

[D] $1{\cdot}25 \times 10^{-3}$ m

77. If the ratio of the diameter of rivet hole to the pitch of rivets is 0·25, then the tearing efficiency of the joint is

[A] 0·50

[B] 0·75

[C] 0·25

[D] 0·87

78. A 60 mm long and 6 mm thick fillet weld carries a steady load of 15 kN along the weld. The shear strength of the weld material is equal to 200 MPa. The factor of safety is

[A] 2·4

[B] 3·4

[C] 4·8

[D] 6·8

79. Which one of the following is ***not*** a friction clutch?

[A] Disc or plate clutch

[B] Cone clutch

[C] Centrifugal clutch

[D] Jaw clutch

80. In a compression coil, spring is cut into two equal parts and the parts are then used in parallel, the ratio of the spring rate to its initial value will be

[A] 1

[B] 2

[C] 4

[D] Indeterminable for want of sufficient data

81. The power transmitted by means of a belt depends upon

[A] velocity of the belt

[B] tension under which the belt is placed on the pulleys

[C] arc of contact between the belt and the smaller pulley

[D] All of the above

82. Nickel-cadmium batteries are preferred more than lead-acid batteries in military vehicles because

[A] it can be easily charged and discharged

[B] it discharge rate is higher

[C] it delivers large amount of power

[D] All of the above

83. A universal coupling is used to connect two mild steel shafts transmitting a torque of 5000 N-m. The allowable shear stress for the shaft is 60 MPa. Assuming that the shafts are subjected to torsion only, the diameter of the shafts is

[A] 60 mm

[B] 75 mm

[C] 90 mm

[D] 105 mm

84. In a flat belt drive, the belt can be subjected to a maximum tension (T) and centrifugal tension (T_C). The condition for transmission of maximum power is given by

[A] $T = T_C$

[B] $T = 2T_C$

[C] $T = 3T_C$

[D] $T = \sqrt{3}T_C$

85. In a chain power transmission, when breaking load (W_b) is in newton, velocity of chain (V) is in m/s, factor of safety is (n) and service factor (K_s) is given, then power transmitted by the chain is

[A] $P = \frac{2V \cdot W_b}{3n \cdot K_s}$ watts

[B] $P = \frac{4V \cdot W_b}{5n \cdot K_s}$ watts

[C] $P = \frac{V \cdot W_b}{2n \cdot K_s}$ watts

[D] $P = \frac{V \cdot W_b}{n \cdot K_s}$ watts

86. In IC engine, cam motion is transferred to the valve through

[A] rocker arm

[B] camshaft

[C] valve stem

[D] piston

87. The mechanism used in a shaping machine is

[A] a closed 4-bar chain having 4 revolute pairs

[B] a closed 6-bar chain having 6 revolute pairs

[C] a closed 4-bar chain having 2 revolute and 2 sliding pairs

[D] an inversion of the single slider-crank chain

88. For full depth of involute spur gears, minimum number of teeth of pinion to avoid interference depends upon

[A] pressure angle

[B] speed ratio

[C] circular pitch

[D] pitch diameter

89. A single-degree freedom spring mass system is subjected to a sinusoidal force of 10 N amplitude and frequency ω along the axis of the spring. The stiffness of the spring is 150 N/m, damping factor is 0·2 and the undamped natural frequency is 10 ω. At steady state, the amplitude of vibration (in m) is approximately

[A] 0·03

[B] 0·07

[C] 0·70

[D] 0·90

90. A rotating disc of 1 m diameter has two eccentric masses of 0·5 kg each at radius of 50 mm and 60 mm at angular positions of 0° and 150° respectively. A balancing mass of 0·1 kg is to be used to balance the rotor. The radial position of the balancing mass is

[A] 50·5 mm

[B] 120·2 mm

[C] 150·3 mm

[D] 280·4 mm

91. Which is a non-positive displacement compressor?

[A] Axial flow compressor

[B] Reciprocating compressor

[C] Roots blower

[D] Vane blower

92. In the jet propulsion,

[A] the propulsive matter is caused to flow around the propelled body

[B] the propulsive matter is ejected from within the propelled body

[C] its functioning does not depend on presence of air

[D] All of the above

93. If the shear force along a section of a beam is zero, the bending moment at that section will be

[A] minimum

[B] maximum

[C] zero

[D] either minimum or maximum

94. Flexible coupling is used because it

[A] is easy to disassemble

[B] is easy to engage and disengage

[C] transmits shocks gradually

[D] prevents shock transmission and eliminates stress reversals

95. When a bolt is subjected to shock loading, the resilience of the bolt should be considered in order to prevent breakage

[A] at shank

[B] at head

[C] at the thread

[D] in the middle

96. In FEM one-dimensional problem, every node is permitted to displace only in

[A] $\tilde{a}$ x direction

[B] $\tilde{a}$ $x-y$ direction

[C] $\tilde{a}$ $x-y-z$ direction

[D] All of the above

97. The most distinguishing feature of the FEM is

[A] the discretization of a given domain into a set of simple sub-domains

[B] not necessary to discretize the given element into a set of simple sub-elements

[C] the discretization of a given sub-domain into a set of simple large shape domains

[D] None of the above

98. For 1-D bar elements, if the structure is having 3 nodes, then the stiffness matrix formed is in the order of

[A] 1×1

[B] 2×2

[C] 3×3

[D] 4×4

99. The most common type of displacement transducer used for vibration measurement is

[A] proximity probe

[B] piezoelectric probe

[C] barometer

[D] LVDT

100. Hybrid electric vehicles are powered by

[A] an internal combustion engine and an electric motor which use energy stored in batteries

[B] an internal combustion engine

[C] an electric motor

[D] a battery

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

★ ★ ★