

Q.B. Series:

C**Common Entrance Test (Engineering) -2018
QUESTION BOOKLET****INSTRUCTIONS**

Q.B. Number:

300871Maximum Time Allowed : 3 Hours
Negative Marking : 0.25 MarksNo. of Questions: 180
Maximum Marks: 180

Roll Number:

Answer Sheet Number:

Please read the following instructions carefully:

1) **Check the booklet thoroughly:** In case of any defect – Misprint, missing question(s) or duplication of question(s) / Page(s), get the booklet changed with the booklet of the same series from the Room Invigilator. No complaint shall be entertained after the entrance test is over.

2) Write your Roll Number and the OMR Answer Sheet Number on the question booklet.

3) Mark carefully your Roll Number, Question Booklet Number, Paper Code, Question Booklets series and Course on the OMR Answer sheet and sign at the appropriate place. Candidates shall be personally responsible for any mistake committed in making these entries in the OMR Answer Sheet. Board shall under no circumstances be responsible for any such mistake.

4) Strictly follow the instructions given by the Centre Supervisor / Room Invigilator and those given on the Question Booklet.

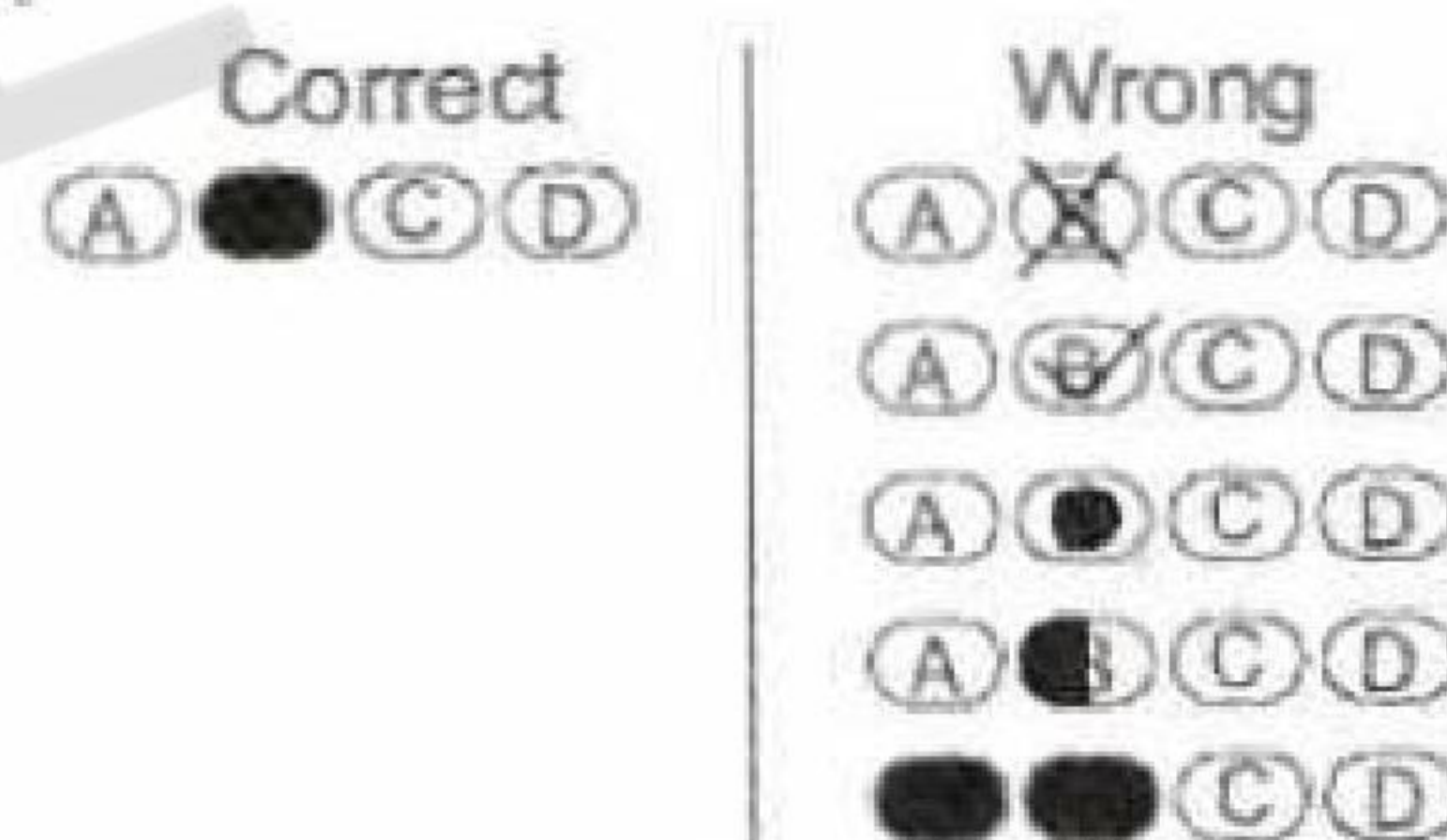
5) Candidates are not allowed to carry any papers, notes, books, calculators, cellular phones, scanning devices, pagers etc. to the Examination Hall. Any candidate found using, or in possession of such unauthorized material, indulging in copying or impersonation or adopting unfair means / reporting late / without Admit Card will be debarred from the written test.

6) Please mark the right responses on the OMR Sheet with ONLY a Blue/Black ball point pen. Use of eraser, whitener (fluid) and cutting on the OMR Answer Sheet is NOT allowed.

7) The test is of objective type containing multiple choice questions (MCQs). Each objective question is followed by four responses. Your task is to choose the correct/best response and mark your response on the OMR Answer Sheet and NOT on the Question Booklet.

8) There will be negative marking of 0.25 marks for every wrong answer.

9) For marking response to a question, completely darken the CIRCLE so that the alphabet inside the CIRCLE is not visible. Darken only ONE circle for each question. If you darken more than one circle, it will be treated as wrong answer. The CORRECT and the WRONG methods of darkening the CIRCLE on the OMR Answer Sheet are shown below.



10) Please be careful while marking the response to questions. The response once marked cannot be changed and if done shall be treated as wrong answer.

11) In view of the tight time span, do NOT waste your time on a question which you find to be difficult.

12) DO NOT make any stray marks anywhere in or around the oval on the OMR Answer Sheet. It will be read as double shading and will make answer invalid. DO NOT fold or wrinkle the OMR Answer Sheet.

13) Rough work MUST NOT be done on the OMR Answer Sheet. Use your test booklet for this purpose.

14) Candidates are provided carbonless OMR Answer Sheet having original copy and candidate's copy. After completing the examination, candidates are directed to fold at perforation on the top of the sheet, tear it to separate original copy and candidate's copy and then hand over the original copy of OMR Answer Sheet to the Room Invigilator and take candidate's copy with them.

DO NOT OPEN THE SEAL OF THIS BOOKLET UNTIL TOLD TO DO SO

Section 1 - Physics

- 1) If a particle moves in a curved path, it must have a component of acceleration
- A) perpendicular to the mass
 - B) perpendicular to the gravity
 - C) perpendicular to the velocity
 - D) parallel to the velocity
-
- 2) When an object is placed between pole and focus of a concave mirror, then the images formed are
- A) real, erect and magnified
 - B) virtual, erect and magnified
 - C) virtual, erect and non-magnified
 - D) virtual, erect and diminished
-
- 3) The property of the substance which shows how easily a substance can be magnetized, when placed in a magnetic field is called
- A) Magnetic Susceptibility
 - B) Magnetic flux density
 - C) Magnetic Permeability
 - D) Magnetic Field
-
- 4) Order of magnitude of a physical quantity is the
- A) Power of 5 of the number that describes the quantity
 - B) Power of 10 of the number that describes the quantity
 - C) Power of 100 of the number that describes the quantity
 - D) Power of 0.01 of the number that describes the quantity
-
- 5) Which wave or ray is produced due to decelerating or accelerating charged particles?
- A) Microwaves
 - B) Ultraviolet rays
 - C) Infrared rays
 - D) X-Rays
-
- 6) Which is the INCORRECT statement regarding electric lines of force
- A) Electric lines of force never intersect with each other
 - B) Electric lines of force are always perpendicular to equipotential surface
 - C) Electric lines of force start from positive charge and terminate on negative charge
 - D) Electric lines of force are always parallel to equipotential surface
-
- 7) The molecule of a monatomic gas has
- A) Only one translational degree of freedom
 - B) Only two translational degrees of freedom
 - C) Only three translational degrees of freedom
 - D) No translational degrees of freedom at all
-
- 8) The force of attraction between two Lead balls, of radius 10 cm and 1 cm that are placed with their centres 1 metre apart is (The density of Lead is $5.51 \times 10^3 \text{ kg/m}^3$.)
- A) $3.5 \times 10^{-11} \text{ N}$
 - B) $0.35 \times 10^{-11} \text{ N}$
 - C) $35 \times 10^{-11} \text{ N}$
 - D) $350 \times 10^{-11} \text{ N}$
-
- 9) Work done in displacing a Magnetic Dipole of magnetic moment M , (Bar Magnet) in Uniform Magnetic Field B from an angle θ_1 to θ_2 is
- A) $W = B (\cos \theta_1 - \cos \theta_2) / M$
 - B) $W = M (\cos \theta_1 - \cos \theta_2) / B$
 - C) $W = M B (\cos \theta_1 + \cos \theta_2)$
 - D) $W = M B (\cos \theta_1 - \cos \theta_2)$
-
- 10) An object approaches a convergent lens from the left of the lens with a uniform speed 10 m/s and stops at the focus. The image moves
- A) away from the lens with a uniform speed 10 m/s
 - B) away from the lens with a uniform acceleration of 10 m/s^2
 - C) away from the lens with a non-uniform acceleration
 - D) towards the lens with a non-uniform acceleration

11) Nucleons are a collection of

- A) electrons and protons
- B) electron and neutrons
- C) protons and neutrons
- D) protons and positrons

12) What is lateral shift with respect to optics?

- A) The parallel distance between the incident ray and the emergent ray
- B) The perpendicular distance between the incident ray and the emergent ray
- C) The perpendicular distance between the incident ray and the reflected ray
- D) The parallel distance between the incident ray and the reflected ray

13) Due to atmospheric refraction effects, the day becomes longer by

- A) 4 minutes
- B) 0 minute
- C) 2 minutes
- D) 1 minute

14) No work is done on the system, but q amount of heat is taken out from the system and given to the surroundings. Express the change in internal energy (ΔU) of this system and what type of wall does the system have?

- A) $\Delta U = w$, wall is adiabatic
- B) $\Delta U = q - w$, closed system
- C) $\Delta U = -q$, thermally conducting walls
- D) $\Delta U = q$, thermally conducting walls

15) Naturally oscillating systems undergo

- A) Simple Harmonic Motion (SHM)
- B) 2 Dimensional Circular Motion
- C) Accelerating Motion
- D) Continuous Motion

16) The device or substances which **DO NOT** obey ohm's law is/are

- A) Copper
- B) Crystal rectifiers
- C) Iron
- D) Resistors

17) If the mains voltage is 230 V, then the peak voltage approximately is

- A) 230 V
- B) 162 V
- C) 325 V
- D) 330 V

18) Focal length, radius of curvature and power of a plane mirror respectively are

- A) infinity, infinity and zero
- B) infinity, infinity and infinity
- C) zero, zero and finite
- D) finite, zero, zero

19) A cyclist comes to a skidding stop in 10 m. During this process, the force on the cycle due to the road is 200 N and is directly opposed to the motion. How much work does the road do on the cycle ?

- A) 2000 J
- B) -2000 J
- C) 20 J
- D) - 20 J

20) Law that proves that different masses accelerate to the earth at the same rate, but with different forces is

- A) Newton's first law
- B) Newton's second law
- C) Newton's third law
- D) Combination of Newton's first and third law

21) My friend has a Banjo clock. It has a pendulum. For every 1.0 sec the pendulum performs one full swing. If an object at the end of the string weighs 10.0 N, what is the length of the pendulum?

- A) 0.25 m
- B) 2.5 m
- C) 0.5 m
- D) 0.15 m

22) The system that returns to equilibrium as quickly as possible without oscillating is

- A) Overdamped
- B) Critically damped
- C) Underdamped
- D) Undamped

23) What modulation index and side bands are produced when a message of frequency 10 KHz and peak voltage of 10 volts is used to modulate a carrier frequency of 1 MHz and peak voltage of 20 volts?

- A) Modulation index is 1. The side bands are 1010 - 990 KHz
- B) Modulation index is 0.5. The side bands are 1010 - 990 KHz
- C) Modulation index is 2. The side bands are 1020 - 980 KHz
- D) Modulation index is 0.5. The side bands are 1020 - 980 KHz

24) Galvanometer can be converted into ammeter by

- A) low resistance called shunt resistance in parallel to the galvanometer
- B) very large resistance in parallel to the galvanometer
- C) series connection with a very small resistance
- D) series connection with a very high resistance

25) In a semiconductor, the concentration of minority carriers depends mainly on

- A) the extent of doping
- B) temperature
- C) the applied bias current
- D) voltage

26) Which of the following properties is NOT true for electromagnetic waves?

- A) The waves are transverse in nature
- B) The waves are longitudinal in nature
- C) The waves propagate through space with the speed of light
- D) The energy in electromagnetic wave is divided equally between electric fields and magnetic field vectors

27) If a point charge q is moving in a circle of radius r with speed v , then time period T of the point charge will be

- A) $T = 2\pi r / v$
- B) $T = 2\pi r * v$
- C) $T = \pi r / 2v$
- D) $T = \pi r / v$

28) The value of magnetic quantum number of the last electron of "Na" is

- A) 3
- B) 2
- C) 1
- D) 0

29) The minimum negative potential given to anode plate at which photoelectric current becomes zero is called

- A) Compton Effect
- B) Stopping Potential
- C) Moseley's Law
- D) Photoelectric Effect

30) A primary coil is connected with an AC source and a bulb is connected with the secondary coil. The voltage across the bulb is 6.0 V and the current through the bulb is 0.4 A. The turns ratio is 5:1 ($N_P : N_S = 5:1$). Calculate the current in the primary coil.

- A) 8 A
- B) 0.8 A
- C) 12.5 A
- D) 1.25 A

31) Two small charged spheres have charges of 2×10^{-7} C and 3×10^{-7} C. They are placed 30 cm apart in air. What is the force between them?

- A) $F = 6 \times 10^{-3}$ N
- B) $F = 0.6 \times 10^{-3}$ N
- C) $F = 6.5 \times 10^{-3}$ N
- D) $F = 0.65 \times 10^{-3}$ N

32) The net electric charge enclosed by a Gaussian surface of dipole is

- A) 0 C
- B) 1 C
- C) 2 C
- D) 3 C

33) Which of these statements is true regarding photoelectric emission?

- A) Number of photoelectrons ejected per second is directly proportional to intensity of incident light provided the frequency of incident light is greater than threshold frequency
- B) Number of photoelectrons ejected per second is inversely proportional to intensity of incident light provided the frequency of incident light is greater than threshold frequency
- C) Number of photoelectrons ejected per second is directly proportional to intensity of incident light provided the frequency of incident light is smaller than threshold frequency
- D) Number of photoelectrons ejected per second is inversely proportional to intensity of incident light provided the frequency of incident light is smaller than threshold frequency

34) The "Uplink" satellite communication frequency bands of "C" band are

- A) 5.925 - 6.425 GHz
- B) 3.7 - 4.2 GHz
- C) 5.925 - 6.425 MHz
- D) 3.7 - 4.2 MHz

35) The resistance of a conductor does NOT depend on

- A) Length and temperature of the conductor
- B) Area of cross-section of the conductor
- C) Material of the conductor
- D) Weight of the conductor

36) The three types of expansion that takes place in solid are

- A) Linear Expansion, Superficial Expansion and Cubical Expansion.
- B) Volume Expansion, Real expansion and Linear Expansion
- C) Apparent Expansion, Volume Expansion and Real expansion.
- D) Linear Expansion, Superficial Expansion and Pressure Coefficient Expansion.

37) What is the reason for earth NOT moving towards the moon, even though moon attracts the earth?

- A) The mass of the earth is much larger than the mass of the moon, it accelerates at a rate lesser than the acceleration rate of the moon towards the earth
- B) The mass of the moon is much larger than the mass of the earth, it accelerates at a rate lesser than the acceleration rate of the earth towards the Moon
- C) The mass of the Earth is similar to that of the moon, and both accelerate at a same rate
- D) Both experience unequal gravitational forces from each other

38) Magnetic energy density in an inductor is given by

- A) $U_B = B^2 / 2\mu_0$
- B) $U_B = B^2 \cdot 2\mu_0$
- C) $U_B = 2B^2 / \mu_0$
- D) $U_B = B^2 + 2\mu_0$

39) The resistance of the platinum wire of a platinum resistance thermometer at the ice point is $5\ \Omega$ and at steam point is $5.23\ \Omega$. When the thermometer is inserted in a hot bath, the resistance of the platinum wire will be $5.795\ \Omega$. Calculate the temperature of the bath.

- A) $3.456\ ^\circ\text{C}$
- B) $34.565\ ^\circ\text{C}$
- C) $345.65\ ^\circ\text{C}$
- D) $45.65\ ^\circ\text{C}$

40) A ball is thrown horizontally from a height of 100 m with an initial speed of 15 m/s. How far does it travel horizontally in the first 2 seconds?

- A) 3 m
- B) 7.5 m
- C) 30 m
- D) 0.3 m

41) Silicon dioxide layer is found in which of the following devices?

- A) NPN transistor
- B) Tunnel diode
- C) JFET
- D) MOSFET

42) The intrinsic carrier concentration of silicon sample at 300 K is $1.5 \times 10^{16}/\text{m}^3$. What is the density of minority carrier? (after doping, the number of majority carriers is $5 \times 10^{20}/\text{m}^3$)

- A) $4.5 \times 10^{11}/\text{m}^3$
- B) $3.33 \times 10^4/\text{m}^3$
- C) $5 \times 10^{20}/\text{m}^3$
- D) $3 \times 10^{-5}/\text{m}^3$

43) In a bar magnet, the ratio of magnetic length to geometrical length is nearly

- A) 0.74
- B) 0.80
- C) 0.84
- D) 0.94

44) A small town is located 10 km away from a power plant. An average of 120 kW of electric power is sent to this town. The transmission lines have a total resistance of $0.40\ \Omega$. Calculate the power loss, if the power is transmitted at 240 V.

- A) 100 W
- B) 10 W
- C) 100 kW
- D) 10 kW

45) A system has two charges $q_A = 2.5 \times 10^{-7}\ \text{C}$ and $q_B = -2.5 \times 10^{-7}\ \text{C}$ located at points A: (0, 0, -15 cm) and B: (0, 0, +15 cm), respectively. What is the magnitude and direction of electric dipole moment of the system?

- A) $7.5 \times 10^{-8}\ \text{cm}$, from positive to negative charge
- B) $0.75 \times 10^{-8}\ \text{cm}$, from negative to positive charge
- C) $7.5 \times 10^{-8}\ \text{cm}$, from negative to positive charge
- D) $0.75 \times 10^{-8}\ \text{cm}$, from positive to negative charge

46) What is the moment of inertia of a ring about a tangent to the circle in the plane of a ring?

- A) MR^2
- B) $2MR^2$
- C) $(3/2)MR^2$
- D) $(1/2)MR^2$

47) The three central concepts in Newtonian mechanics are

- A) Mass, Motion and Gravity
- B) Mass, Motion and Force
- C) Weight, speed and Gravity
- D) Force, Mass and Acceleration

48) For a copper block, find the electric field which can give, on an average, 1 eV energy to a conduction electron. (The mean free path of conduction electrons in copper is given as $4 \times 10^{-8}\ \text{m}$)

- A) $2.62 \times 10^7\ \text{V/m}$
- B) $2.64 \times 10^7\ \text{V/m}$
- C) $2.5 \times 10^7\ \text{V/m}$
- D) $2.58 \times 10^7\ \text{V/m}$

49) Dispersion without deviation is produced by two thin (small angled) prisms which are combined together. One prism has angle 5° and refractive index 1.56. If the other prism has refractive index 1.7, what is its angle?

- A) 3°
- B) 4°
- C) 5°
- D) 6°

50) Considering the fact that the speed of light in glass is not independent of the colour of light, which of the statement is true?

- A) violet light travels slower than red light
- B) violet light travels faster than red light
- C) violet light travels same as red light
- D) only white light will be travelling.

51) Which one of the following is NOT emitted by radioactive elements?

- A) Alpha Rays
- B) Beta Rays
- C) Delta Rays
- D) Gamma Rays

52) The phenomenon that occurs when the frequency of forced vibrations on an object matches the natural frequency of that object, and produces a dramatic increase in amplitude is called

- A) Resonance
- B) Beats
- C) Forced vibration
- D) Damping

53) Why there are two propellers in a helicopter?

- A) Due to conservation of linear momentum, the helicopter itself would have turned in the opposite direction, if it had only one propeller
- B) Due to conservation of angular momentum, the helicopter itself would have turned in the opposite direction, if it had only one propeller
- C) The helicopter can't rise up with one
- D) The helicopter would not gain speed with one

54) What is the amount of heat needed to raise the temperature of the gas in a cylinder of fixed capacity (44.8 litres) that contains helium gas at standard temperature and pressure, by 15.0°C ?

($R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$).

- A) 374 J
- B) 37.4 J
- C) 5.42 J
- D) 54.2 J

55) The equation ($\tan \theta = B_2 / B_1$), where B_1 and B_2 are magnetic fields perpendicular to each other represents

- A) Horizontal Component of Earth's Magnetic Field
- B) Tangent Law
- C) Dip or Inclination
- D) Declination

56) An athlete runs exactly once around a circular track of length 500 m. The runner's displacement in the race is

- A) 50 m
- B) 5 m
- C) 0.5 m
- D) 0 m

57) "Gravitational constant (G)", "Planck's constant (h)" and Velocity of light (c) are

- A) Dimensional variables
- B) Dimensionless variables
- C) Non-dimensional constants
- D) Dimensional constants

58) The factor R/N_A in an ideal gas law is

- A) Celsius constant
- B) Kelvin constant
- C) Universal gas constant
- D) Boltzmann's constant

59) The enthalpy change of a chemical reaction in which 1 mole of a pure substance is formed from the free elements in their most stable states under standard state conditions is called

- A) Molar enthalpy of vaporization
 - B) Standard enthalpy of fusion
 - C) Standard enthalpy of vaporization
 - D) Standard Molar Enthalpy of Formation
-

60) The work done by a given force on a body depends only on

- A) The force, the displacement and the angle between them.
- B) The force, the velocity and the angle between them.
- C) The acceleration, the velocity and the angle between them.
- D) The force, the velocity and acceleration between them.