OPENDET – VI : Entrance Test for Engineering Diploma Programmes

May, 2006

Total No. of Questions = 100   *Time : 2 Hours*

— All questions are compulsory.

— Use of calculator is **not** allowed. Rough work may be done in the space provided at the end of the Test booklet.

— The Test booklet has the following four tests :

Test I	Mathematics	No. of Questions 40
Test II	Physics	No. of Questions 20
Test III	Chemistry	No. of Questions 20
Test IV	General Awareness and Communication Skills	No. of Questions 20

Read the instructions given on the OMR Answer Sheet carefully before you start.

HOW TO FILL UP THE INFORMATION ON THE ENTRANCE TEST OMR ANSWER SHEET

While filling up the OMR Answer Sheet, you should follow the following guidelines :

1. Write your complete Roll Number. This should correspond to the roll number already supplied to you. Also write your correct name, address with pin code in the space provided, in ink. Put your signatures on the Answer Sheet with date, in ink. Ensure that the Invigilator in your examination hall also puts his signatures with date on the OMR Answer Sheet at the space provided. You should use HB pencil to mark the answers of the questions on the OMR Answer Sheet.

2. Do not make any stray marks on the OMR Answer Sheet.

3. Write correct information in numerical digits in Roll No., Programme Code, Date and Month and Examination Centre Code Columns. **The column of Course Code should be left blank.** The corresponding rectangle should be dark enough and should be filled in completely.

4. Each question is followed by four probable answers, which are numbered 1, 2, 3 and 4. You should select and show only one answer to each question considered by you as the most appropriate or the correct answer. Select the most appropriate answer. Then by using HB pencil, blacken the rectangle bearing the correct answer number against the serial number of the question. **If you find that answer to any question is none of the four alternatives given under the question you should darken the rectangle '0'.**

5. If you wish to change your answer, ERASE completely the already darkened rectangle by using a good quality eraser and then blacken the rectangle bearing your revised answer number. If incorrect answer is not erased completely, smudges will be left on the erased rectangle and the question will be read as having two answers by the Optical Mark Reader (OMR) and will be ignored for giving any credit.

6. No credit will be given if more than one answer is given for one question. Therefore, you should select the most appropriate answer.

7. You should not spend too much time on any one question. If you find any particular question difficult, leave it and go to the next. If you have time left after answering all the questions, you may go back to the unanswered ones.

8. There is no negative marking for wrong answers.

GENERAL INSTRUCTIONS

1. Mobile Phones, calculators, books, slide-rules, foot rulers, note-books or written notes, etc. are not allowed inside the examination hall.

2. You should follow the instructions given by the Centre Superintendent, observers and by the Invigilators at the examination venue. If you violate the instructions you will be disqualified.

3. Any candidate found copying or receiving or giving assistance in the examination will be disqualified.

4. The Test Booklet and the OMR Answer Sheet would be supplied to you by the Invigilators. **After the examination is over, you should hand over the Test Booklet and the OMR Answer Sheet to the Invigilator before leaving the examination hall.** Any candidate who does not return the Question Booklet and the OMR Answer Sheet will be disqualified.

5. Candidates arriving late will not be permitted to enter the examination hall. The reporting time is 9.15 A.M. The examination will start at 10.00 A.M. and will be over at 12.00 noon.

6. All rough work is to be done on the test booklet itself and not on any other paper. Scrap paper is not permitted. For arriving at answers you may work in the margins, make some markings or underline in the test booklet itself.

7. The University reserves the right to cancel scores of any candidate who impersonates or uses malpractices. The examination is conducted under uniform conditions. The University would also follow a procedure to verify the validity of scores of all examinees uniformly. If there is substantial indication that your performance is not genuine, the University may cancel your score.

TEST I
MATHEMATICS

1. If $\dfrac{a}{b} = \dfrac{4}{3}$, then $\dfrac{3a + 2b}{3a - 2b} = ?$

   (1) — 1 (2) 3

   (3) 5 (4) 6

2. If $(64)^2 - (36)^2 = 20z$, the value of z is

   (1) 70 (2) 180

   (3) 120 (4) 140

3. If $\sqrt{3^n} = 81$, then n = ?

   (1) 2 (2) 4

   (3) 6 (4) 8

4. $(64)^{-2/3} \times \left(\dfrac{1}{4}\right)^{-2}$ is equal to

   (1) 1 (2) $\dfrac{1}{4}$

   (3) 4 (4) 16

5. The L.C.M. of 26, 56, 104 and 182 is

   (1) 546 (2) 1274

   (3) 728 (4) 784

6. $0.006 \div x = 0.6$. Find 'x'.

   (1) 0.01 (2) 0.1

   (3) 0.001 (4) 1.0

7. $\dfrac{(0.6)^4 - (0.5)^4}{(0.6)^2 + (0.5)^2}$ is equal to

   (1) 1.1 (2) 0.1

   (3) 11 (4) 0.11

8. $\dfrac{\dfrac{1}{4} + \dfrac{1}{4} \div 1\dfrac{1}{4}}{\dfrac{1}{4} \times \dfrac{1}{4} + 2\dfrac{1}{4}} = ?$

(1) $\dfrac{16}{25}$

(2) $\dfrac{32}{185}$

(3) $\dfrac{36}{185}$

(4) None of the above

9. $\sqrt{48} \times \sqrt{12} = ?$

(1) 48

(2) 12

(3) 24

(4) 6

10. Conjugate of $\sqrt{3}\,i + 2$ is

(1) $2\sqrt{3}\,i$

(2) $3\sqrt{2}\,i$

(3) $-\sqrt{3}\,i + 2$

(4) $\dfrac{2}{\sqrt{3}\,i}$

11. $a^2 + b^2 = ?$

(1) $(a + b)^2 - 2ab$

(2) $(a + b)^2 + 2ab$

(3) $(a^2 + b^2) - 2ab$

(4) $(a^2 + b^2) + 2ab$

12. $\dfrac{x^2 - y^2}{x^3 - y^3} = ?$

(1) $\dfrac{x + y}{x^2 + y^2}$

(2) $\dfrac{x - y}{x^2 - y^2}$

(3) $\dfrac{1}{x - y}$

(4) $\dfrac{x + y}{x^2 + y^2 + xy}$

13. $y = x^2 + 2x - 3$. Find the value of y when $x = 0$.

(1) 0

(2) -3

(3) 2

(4) -1

14. GCD of $(x - 2)$, $(x^2 - 4)$ and $(x^3 - 8)$ is

(1) $(x - 2)$

(2) $(x^2 - 4)$

(3) $(x^3 - 8)$

(4) $(x^2 - 4)(x - 2)$

15. The average of first five multiples of 3 is

(1)   3   (2)   9

(3)   12   (4)   15

16. Four-fifth of a certain number is 64. Half of that number is

(1)   16   (2)   32

(3)   40   (4)   80

17. $5^{x+3} = (25)^{3x-4}$, then the value of 'x' is

(1) $\dfrac{5}{11}$ (2) $\dfrac{11}{5}$

(3) $\dfrac{11}{3}$ (4) $\dfrac{13}{5}$

18. $\sqrt{3\cdot6\% \text{ of } 40}$ = ?

(1)   2·8   (2)   1·8

(3)   1·2   (4)   None of the above

19. If 15 toys cost Rs. 234, what do 35 toys cost ?

(1)   Rs. 564   (2)   Rs. 546

(3)   Rs. 654   (4)   Rs. 465

20. A scooterist covers a certain distance at 36 kmph. How many metres does he cover in 2 minutes ?

(1)   1200 m   (2)   1000 m

(3)   1020 m   (4)   1002 m

21. The circumference of a circle is 88 m. Find its area.

(1)   616 m^2 (2)   644 m^2

(3)   634 m^2 (4)   624 m^2

22. If the area of a square with side 'a' is equal to the area of a triangle with base 'a', then the altitude of the triangle is

(1) $\dfrac{a}{2}$ (2)   a

(3)   2a   (4)   4a

23. The surface area of a cube is 486 cm^2. Find its volume.

(1) 9 cm

(2) 9 cm^3

(3) 729 cm

(4) 729 cm^3

24. A 4 cm cube is cut into 1 cm cubes. The total surface area of all the small cubes is

(1) 96 cm^2

(2) 24 cm^2

(3) 384 cm^2

(4) None of the above

25. Ratio of volume to lateral surface area of a cone of radius 'r' and height 'h' is

(1) $\dfrac{r}{h}$

(2) $\dfrac{rh}{\sqrt{h^2 + r^2}}$

(3) $\dfrac{rh}{3\sqrt{h^2 + r^2}}$

(4) $\dfrac{r}{3h}$

26. $\tan^2\theta + 1 = ?$

(1) $\operatorname{cosec}^2\theta$

(2) $\cot^2\theta$

(3) $\sec^2\theta$

(4) $-\sec^2\theta$

27. Solve the equations for 'x' and 'y'

x + y = 12, 2x — y = 1

(1) $\dfrac{13}{3}, \dfrac{23}{2}$

(2) $\dfrac{13}{3}, \dfrac{23}{3}$

(3) $\dfrac{13}{2}, \dfrac{23}{2}$

(4) $\dfrac{13}{2}, \dfrac{23}{3}$

28. Factorise : $2x^2 — 14x + 24$

(1) 2 (x — 3) (x + 4)

(2) (x — 3) (x — 4)

(3) 2 (x + 3) (x + 4)

(4) 2 (x — 3) (x — 4)

29. $f(n) = n^2 — 2n + 13$. Find the value of f(1).

(1) 11

(2) 12

(3) 13

(4) 10

30. $\dfrac{\sin^2 \theta + \cos^2 \theta}{\tan \theta \cdot \cos \theta} = ?$

(1) $\tan \theta$ (2) $\cos \theta$

(3) 1 (4) $\operatorname{cosec} \theta$

31. In a right-angled triangle $\angle B = 90°$, $AB = 3$ cm and $\angle C = 30°$. Find the lengths of the other two sides.

(1) $BC = 2\sqrt{3}$ cm, $AC = \sqrt{3}$ cm

(2) $BC = 3\sqrt{3}$ cm, $AC = 6$ cm

(3) $BC = AC = \sqrt{3}$ cm

(4) Data is insufficient

32. $\dfrac{1 - \sec \theta}{- \tan \theta} = ?$

(1) $\dfrac{\tan \theta}{\sec \theta + 1}$ (2) $\dfrac{-\tan \theta}{\sec \theta - 1}$

(3) $\dfrac{\tan \theta}{\sec \theta - 1}$ (4) $\dfrac{-\tan \theta}{\sec \theta + 1}$

33. $\cos^2 45° \cdot \sin^2 45° = ?$

(1) 1 (2) 0

(3) $\dfrac{1}{2}$ (4) $\dfrac{1}{4}$

34. $(\tan^2 60°) \cdot (\operatorname{cosec}^2 60° - 1) = ?$

(1) 1 (2) $\dfrac{1}{3}$

(3) 3 (4) $3\sqrt{3}$

35. $\tan \theta = \dfrac{6}{8}$. Find $11 \operatorname{cosec} \theta - 1$.

(1) $\dfrac{3}{52}$ (2) $\dfrac{-3}{52}$

(3) $\dfrac{52}{3}$ (4) $\dfrac{-52}{3}$

36. $x^2 - y^2 = 9$ and $x + y = 9$. Then $x - y = ?$

    (1)   0   (2)   9

    (3)   1   (4)   4

37. Rationalising factor of $2\sqrt[3]{3}$ is

    (1) $\sqrt{3}$

    (2) $\sqrt[3]{9}$

    (3) $2\sqrt{3}$

    (4) $\sqrt{9}$

38. What is the coefficient of x^2 in $(2x^3 - 3x^2 + x + 1) + (6x^2 - 3x + 1)$?

    (1)   3

    (2) $3x^2$

    (3) -3

    (4) $-3x^2$

39. Which of the following identities is *wrong* ?

    A. $\sin^2\theta - 1 = \cos^2\theta$

    B. $\tan^2\theta + 1 = \sec^2\theta$

    C. $\csc^2\theta - 1 = \cot^2\theta$

    (1)   B

    (2)   C

    (3)   A

    (4)   All true

40. $\csc^3 90° \cdot \sin^2 45° \cdot \cot 60° = ?$

    (1) $\dfrac{1}{2}$

    (2) $\dfrac{1}{2\sqrt{3}}$

    (3) $2\sqrt{3}$

    (4) $\dfrac{\sqrt{3}}{2}$

TEST II

PHYSICS

41. A physical quantity x is calculated from the relation $x = \dfrac{2a}{b^2}$. If errors in measurement of a and b are 2% and 4% respectively, then accuracy in measurement of x is

    (1) 90%   (2) 98%

    (3) 96%   (4) 94%

42. The velocity v of a particle is given in terms of distance s as $v = \dfrac{s}{a+b} + cs$. The dimensions of a, b and c are

    (1) $T; T^2; T^{-1}$ (2) $T; T; T^{-1}$

    (3) $T^2; T; T$ (4) $T; T; T^{-1}$

43. Which among the following is the smallest unit of length ?

    (1) Micron   (2) mm

    (3) Angstrom   (4) Nanometre

44. "Speed of light is the same no matter how it is measured" was first contemplated by

    (1) A.A. Michelson

    (2) Jean Foucault

    (3) Armand Fizeau

    (4) Albert Einstein

45. Theodolite is an instrument used by

    (1) Surveyors

    (2) Cartographers

    (3) Navigators

    (4) Pilots

46. Construction of a submarine is based on

    (1) Pascal's Law

    (2) Newton's Laws of Motion

    (3) Archimedes' Principle

    (4) Hooke's Law

47. Two bodies A and B, of masses 1 kg and 4 kg respectively, have equal linear momentum. The ratio of their kinetic energies is

    (1) 1 : 4   (2) 1 : 2

    (3) 4 : 1   (4) 1 : 16

48. The energy of a particle moving at 5 m/sec is 125 J. Its mass is

(1) 10 kg

(2) 4 kg

(3) 6 kg

(4) 25 kg

49. If the speed of a car is increased three times the distance needed to stop with the same braking effect will be

(1) 3 times less

(2) one-third

(3) 3 times more

(4) some other number

50. A car travelling at 90 km/h takes a U turn in 10 seconds. The acceleration of the car is

(1) 4 m/s^2

(2) 9 m/s^2

(3) 5 m/s^2

(4) 6 m/s^2

51. A body of mass 10 kg, velocity 10 m/s collides with a stationary body of mass 5 kg. After collision, both bodies stick to each other. The common velocity would be

(1) $\dfrac{3}{20}$ m/s

(2) $\dfrac{20}{3}$ m/s

(3) $\dfrac{10}{3}$ m/s

(4) $\dfrac{3}{10}$ m/s

52. An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m ? (g = 10 m/s^2)

(1) 4 s

(2) 5 s

(3) 8 s

(4) 10 s

53. The frictional force F, the reaction R and the coefficient of friction μ are related as

(1) F = μR

(2) R + μF = 0

(3) R = μ / F

(4) R = μF

54. When an air bubble rises in water, what happens to its potential energy ?

(1) Increases

(2) Decreases

(3) Remains same

(4) None of the above

55. If S denotes sound energy, E denotes electrical energy, M denotes magnetic energy, the correct representation of recording and reproduction in an audio tape recorder is

(1) $E \to M \to E \to S$

(2) $S \to E \to M \to E \to S$

(3) $E \to S \to M \to S$

(4) $S \to M \to E \to M \to S$

56. Two thin blankets are warmer than a single one of the same thickness because

(1) air layer is trapped in between the blankets

(2) the distance of heat transmission is increased

(3) the total mass of the blankets will be more

(4) None of the above

57. The dam of a water reservoir is thick at the bottom because

(1) water pressure remains unchanged with depth

(2) water pressure increases with depth

(3) water pressure decreases with depth

(4) None of the above

58. Domestic electrical wiring is basically a

(1) combination of series and parallel connection

(2) parallel connection

(3) series connection

(4) series connection in each room and parallel elsewhere

59. Resistance of 2 Ω and 3 Ω are connected in series. If the potential difference across the 2 Ω resistor is 3 V, the potential difference across the 3 Ω resistance is

(1) 4·5 V

(2) 9 V

(3) 3 V

(4) 2 V

60. The phenomenon of radioactivity is due to

(1) stable nuclei

(2) unstable nuclei

(3) stable electronic configuration

(4) unstable electronic configuration

TEST III
CHEMISTRY

61. Which of the following is a mixture ?

    (1) Air   (2) Water

    (3) Alum   (4) Glucose

62. Which of the following is a compound ?

    (1) Caustic soda

    (2) Gunpowder

    (3) Lead

    (4) None of the above

63. Which of the following is an anion ?

    (1) Cu^{++} (2) CO_3^{--}

    (3) Na^+ (4) Ni

64. The sequential filling of electrons in atomic orbitals is governed by

    (1) Pauli's Exclusion Principle

    (2) Hund's Rule

    (3) Aufbau Principle

    (4) Uncertainty Principle

65. The Uncertainty Principle was enunciated by

    (1) Einstein   (2) Heisenberg

    (3) Rutherford   (4) Pauli

66. The principal quantum number is related to

    (1) size of orbital

    (2) angular momentum of orbital

    (3) angular momentum of spin

    (4) configuration of orbital in space

67. $2p$ orbital has

    (1) $n = 1, l = 2$

    (2) $n = 1, l = 0$

    (3) $n = 2, l = 1$

    (4) $n = 2, l = 0$

68. Ease of formation of the anion is favoured by

    (1) lower value of ionisation potential

    (2) lower value of electron affinity

    (3) higher value of electron affinity

    (4) lower value of electronegativity

69. Two atoms with electronegativities of 1·2 and 3·0 respectively, would form

    (1) ionic bond   (2) covalent bond

    (3) co-ordinate bond   (4) metallic bond

70. Which of the following compounds shows hydrogen bonding ?

    (1) CH_4 (2) H_2O

    (3) NaCl   (4) NaOH

71. π-bond is formed

    (1) by the overlapping of atomic orbitals on the axis of nuclei

    (2) by mutual sharing of pi electrons

    (3) by sidewise overlapping of half-filled p-orbitals

    (4) by overlapping of s-orbitals with p-orbitals

72. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is known as

    (1) Critical temperature

    (2) Boyle's temperature

    (3) Inversion temperature

    (4) Reduced temperature

73. Ideal gas equation can be represented by

    (1) $\dfrac{P_1 V_1}{T_1} = \dfrac{P_2 V_2}{T_2}$

    (2) $\dfrac{V_1 T_1}{P_1} = \dfrac{V_2 T_2}{P_2}$

    (3) $\dfrac{P_1 T_1}{V_1} = \dfrac{P_2 V_2}{T_2}$

    (4) $\dfrac{V_1 V_2}{T_1 T_2} = P_1 P_2$

74. If 4 g of O_2 diffused through a very narrow hole, how much H_2 would have diffused under identical conditions through the same hole ?

    (1) 16 g   (2) 1 g

    (3) 32 g   (4) 64 g

75. The partial pressure of hydrogen in a flask containing 2·016 g of H_2 and 16·00 g of oxygen is

    (1) $\dfrac{1}{8}$ of the total pressure

    (2) $\dfrac{3}{2}$ of the total pressure

    (3) $\dfrac{1}{4}$ of the total pressure

    (4) $\dfrac{2}{3}$ of the total pressure

76. Electrolytes can conduct electricity, because

    (1) their molecules contain unpaired electrons, which are mobile

    (2) their molecules contain loosely held electrons, which become free under the influence of voltage

    (3) the molecules break up into ions, when voltage is applied

    (4) the molecules are broken up into ions, when the electrolyte is fused or dissolved in a solvent

77. When a solution of weak electrolyte is diluted, the molar conductivity of the solution

    (1) increases, because a mole of the electrolyte gives more ions in dilute solution

    (2) decreases, because the weak electrolyte weakens further

    (3) increases, because a large volume of solution takes part in conducting electricity

    (4) decreases, because of a lesser availability of conducting ions

78. Which one of the following does *not* conduct electricity ?

    (1) Molten NaCl

    (2) NaCl crystal

    (3) Solution of NaCl in water

    (4) None of the above

79. What will be the ratio of Avogadro numbers of 23 g of Na and 32 g of O_2 at NTP ?

    (1) 23 : 32

    (2) 11 : 8

    (3) 8 : 11

    (4) 1 : 1

80. Sodium hydroxide is a stronger base than sodium bicarbonate, because

    (1) it has lower molecular weight

    (2) it gives higher number of sodium ions in water

    (3) it is highly ionised in water

    (4) there is a strong bond between sodium and hydroxyl group

TEST IV
GENERAL AWARENESS AND COMMUNICATION SKILLS

81. If the length of a lever is increased to infinity, we may even lift

(1) Water

(2) Earth

(3) Air

(4) Solar System

82. Mohenjodaro is located in

(1) Punjab

(2) Sind

(3) Gujarat

(4) Uttar Pradesh

83. Tulsidas lived during the reign of

(1) Babar

(2) Akbar

(3) Aurangzeb

(4) None of the above

84. Who is called "The Hindu Napoleon" ?

(1) Samudragupta

(2) Chandragupta Vikramaditya

(3) Harsh

(4) Chandragupta Maurya

85. All machines suffer a loss of efficiency due to

(1) a lack of force

(2) friction

(3) a lack of distance

(4) force being exchanged for distance

86. One litre of ice and one litre of water, both at 0° C have

(1) same weight

(2) different weight

(3) different volumes

(4) both (2) and (3)

87. Einstein has given the formula $E = mc^2$ where c stands for

    (1) velocity of light

    (2) velocity of sound

    (3) a constant

    (4) a curvature

88. The Radcliffe Line is the international border between

    (1) India and Pakistan

    (2) India and China

    (3) India and Bangladesh

    (4) Pakistan and Afghanistan

89. What do you call a narrow neck of land that connects two large land masses ?

    (1) Peninsula

    (2) Isthmus

    (3) Cape

    (4) Strait

90. National Game of our country is

    (1) Cricket

    (2) Kabaddi

    (3) Hockey

    (4) Football

Directions : *In questions 91, 92 and 93, select the choice which is closest in meaning to the given word (synonym).*

91. SORROW

    (1) Misery

    (2) Thrill

    (3) Disease

    (4) Madness

92. CHEAP

    (1) Inexpensive

    (2) Costly

    (3) Chic

    (4) Superb

93. SCANDAL

    (1) Scam

    (2) Fame

    (3) Prosperity

    (4) Property

Directions : *In questions 94, 95 and 96, select the choice which is closest to the opposite in meaning of the given word (antonym).*

94. MIGHTY

    (1) Ignorant

    (2) Powerful

    (3) Feeble

    (4) Average

95. PETIT

    (1) Small

    (2) Large

    (3) Indifferent

    (4) Rich

96. FRIENDLY

    (1) Boisterous

    (2) Arrogant

    (3) Generous

    (4) Stingy

Directions : *For questions 97 and 98 : Each of these statements consists of four underlined sections, one of which is incorrect as per the usage of standard English. You have to identify the segment which is incorrect, in each case.*

97. A block of residential flats / are coming up / near our house. / No error.
          (1)   (2)   (3)   (4)

98. He is writing / for the / past four hours. / No error.
      (1)   (2)   (3)   (4)

Directions : *In questions 99 and 100, fill in appropriate words in the blanks; out of the four alternatives given.*

99. My father _____ down for a nap.

    (1) lay

    (2) laid

    (3) lain

    (4) lie

100. The time he noticed his mistake he put _____ the light and slept.

    (1) up

    (2) down

    (3) in

    (4) out