MT : METALLURGICAL ENGINEERING

Duration: Three Hours   *Maximum Marks*: 1

Read the following instructions carefully.

1. Write your name and registration number in the space provided at the bottom of this page.

2. Take out the Optical Response Sheet (**ORS**) from this Question Booklet **without breaking the seal**.

3. Do not open the seal of the Question Booklet until you are asked to do so by the invigilator.

4. Write your registration number, your name and name of the examination centre at the specified locations on the right half of the **ORS**. Also, using HB pencil, darken the appropriate bubble under each digit of your registration number and the letters corresponding to your test paper code (MT).

5. This Question Booklet contains **16** pages including blank pages for rough work. After opening the seal at the specified time, please check all pages and report discrepancy, if any.

6. There are a total of 65 questions carrying 100 marks. All these questions are of objective type. Questions must be answered on the left hand side of the **ORS** by darkening the appropriate bubble (marked A, B, C, D) using HB pencil against the question number. **For each question darken the bubble of the correct answer**. In case you wish to change an answer, erase the old answer completely. More than one answer bubbled against a question will be treated as an incorrect response.

7. Questions Q.1 – Q.25 carry 1-mark each, and questions Q.26 – Q.55 carry 2-marks each.

8. Questions Q.48 – Q.51 (2 pairs) are common data questions and question pairs (Q.52, Q.53) and (Q.54, Q.55) are linked answer questions. The answer to the second question of the linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is unattempted, then the answer to the second question in the pair will not be evaluated.

9. Questions Q.56 – Q.65 belong to General Aptitude (GA). Questions Q.56 – Q.60 carry 1-mark each, and questions Q.61 – Q.65 carry 2-marks each. The GA questions begin on a fresh page starting from page **10**.

10. Unattempted questions will result in zero mark and wrong answers will result in **NEGATIVE** marks. For Q.1 – Q.25 and Q.56 – Q.60, ⅓ mark will be deducted for each wrong answer. For Q.26 – Q.51 and Q.61 – Q.65, ⅔ mark will be deducted for each wrong answer. The question pairs (Q.52, Q.53), and (Q.54, Q.55) are questions with linked answers. There will be negative marks only for wrong answer to the first question of the linked answer question pair, i.e. for Q.52 and Q.54, ⅔ mark will be deducted for each wrong answer. There is no negative marking for Q.53 and Q.55.

11. Calculator is allowed whereas charts, graph sheets or tables are **NOT** allowed in the examination hall.

12. Rough work can be done on the question paper itself. Additionally, blank pages are provided at the end of the question paper for rough work.

Name	
Registration Number	**MT**

Useful data

Universal gas constant (R) = 8.314 J mol^{-1} K^{-1}
1 Faraday (F) = 96500 Coulombs

Q. 1 – Q. 25 carry one mark each.

Q.1 Which one of the following methods is **NOT** used for numerically solving an ordinary differential equation (ODE)?

(A) Euler's method
(B) Runge-Kutta method
(C) Adam-Bashforth method
(D) Newton-Raphson method

Q.2 If two systems P and Q are in thermal equilibrium with a third system M, then P and Q will also be in thermal equilibrium with each other. This is following

(A) First law of Thermodynamics
(B) Second law of Thermodynamics
(C) Third law of Thermodynamics
(D) Zeroeth law of Thermodynamics

Q.3 Humidification of the blast in the iron blast furnace leads to

(A) lowering of the raceway temperature
(B) increase in raceway temperature
(C) difficulty in pulverized coal injection (PCI)
(D) decrease of the oxygen content in the hot metal

Q.4 Which one of the following refractory materials is **NOT** used in the BOF (LD) working lining?

(A) Tar-bonded dolomite
(B) Pitch-bonded magnesite
(C) Fired and pitch-impregnated magnesite
(D) Graphite-alumina composite

Q.5 In the eutectoid steel, which one of the following structures **DOES NOT** form during continuous cooling?

(A) Fully pearlitic
(B) Pearlitic + bainitic
(C) Fully bainitic
(D) Martensitic

Q.6 Which one of the following is a ferrite stabilizer in steels?

(A) Ni
(B) Cu
(C) Cr
(D) Mn

Q.7 The angle between the line vector and the burgers vector of an edge dislocation is

(A) 0 degree
(B) 90 degrees
(C) 120 degrees
(D) 180 degrees

Q.8 In fracture toughness characterized by K_{IC} or J_{IC}, **I** in the subscript indicates loading by

(A) crack opening mode
(B) forward shear mode
(C) parallel shear mode
(D) perpendicular shear mode

Q.9 In a brazing process the liquid metal fills the gap by which one of the following means?

(A) Capillary infiltration
(B) Gravity infiltration
(C) Pressure infiltration
(D) Vacuum infiltration

Q.10   Which one of the following expands upon solidification?

(A) Low carbon steel   (B) High carbon steel

(C) White cast iron   (D) Gray cast iron

Q.11   For a simple cubic unit cell with unit vectors **i**, **j** and **k**, the angle between lattice vectors [100] and [111] in degrees is

(A) 35.2   (B) 54.7   (C) 60   (D) 90

Q.12   The inflection point of a nonlinear function U(r) is at

(A) $U = 0$ (B) $\ln U = 0$ (C) $dU/dr = 0$ (D) $d^2U/dr^2 = 0$

Q.13   One mole of element P is mixed with one mole of element Q. The entropy of mixing at 0 K is

(A) 0   (B) $-R \ln 0.5$ (C) infinity   (D) $-R \ln 2$

Q.14   Zinc rod is immersed in dilute HCl (pure). If a very small amount of $FeCl_3$ is added to the solution, the corrosion rate of zinc

(A) decreases   (B) increases   (C) remains constant   (D) is zero (passivation)

Q.15   A metal is electrochemically polarized to a potential which is higher than the standard reduction potential of the metal. The overvoltage will be

(A) zero   (B) negative

(C) positive   (D) initially negative, then positive

Q.16   Aluminum is **NOT** commercially produced by carbo-thermic reduction primarily because

(A) aluminum metal will have excessive dissolved oxygen
(B) it melts at too low a temperature
(C) it does not vaporize at reasonable temperatures
(D) Al-Al_2O_3 line is too low in the Ellingham diagram and needs excessively high temperatures

Q.17   VOD process is preferred over AOD process for making extra-low carbon stainless steels because

(A) p_{co} can be lowered to a much lower level in the VOD than in the AOD
(B) AOD does not have adequate stirring
(C) free-board needed for such operation is not available in the AOD
(D) AOD refractory is not stable in contact with extra low carbon steel

Q.18   In froth flotation, collector refers to a reagent which primarily

(A) promotes bubble break-up and stabilizes the foam
(B) adsorbs on the surface of the mineral, and makes it hydrophobic
(C) promotes separation of the particles from the froth
(D) absorbs on the unwanted mineral and makes it sink

Q.19 With the increase in the degree of supercooling, the growth rate of a nucleus follows which of the following trends?

(A) First increases and then decreases   (B) First decreases and then increases

(C) Only increases   (D) Only decreases

Q.20 For a fcc unit cell, the ratio of the number of tetrahedral voids to the number of atoms is

(A) 2:1   (B) 3:1   (C) 4:1   (D) 5:1

Q.21 The material in which there is conduction primarily by holes is

(A) conductor   (B) insulator

(C) p-type semiconductor   (D) n-type semiconductor

Q.22 When load is applied to a material, 'instantaneous' strain develops with

(A) the speed of light   (B) half the speed of light

(C) the speed of sound   (D) infinite speed

Q.23 For a given ductile material, which one of the following tensile properties obtained with non-standard specimen is **NOT** comparable to that obtained with standard specimen?

(A) Elongation to fracture   (B) Tensile strength

(C) Uniform elongation   (D) Yield strength

Q.24 The nature of submerged arc welding flux with basicity index of 0.5 is

(A) neutral   (B) basic   (C) semi-basic   (D) acidic

Q.25 Which one of the following carbon equivalent in steel is considered good for weldability?

(A) 1.0   (B) 0.8   (C) 0.6   (D) 0.4

Q. 26 to Q. 55 carry two marks each.

Q.26 A box contains 5 white balls and 3 red balls. Two balls are withdrawn from the box randomly, one after another (without replacement). The probability that the two balls withdrawn are of different color is

(A) 15/64   (B) 25/64   (C) 25/56   (D) 30/56

Q.27 For a reaction A→B, if the rate of change in concentration of A (C_A), can be written as $-\dfrac{dC_A}{dt} = k.C_A^2$, then the change in concentration with time from initial concentration of A, C_{Ao}, is given by

(A) $(1/C_A) - (1/C_{Ao}) = k.t$ (B) $(C_{Ao} - C_A) = k.t$

(C) $(C_{Ao}^2 - C_A^2) = k.t$ (D) $\ln(C_{Ao}/C_A) = k.t$

Q.28 $Y = k_1 \left[1 - \exp\left(-\dfrac{k_2 \Delta X}{k_3 X} \right) \right]$, where k_1, k_2 and k_3 are constants. If $k_2\Delta X << k_3 X$, the value of Y up

first order of approximation would be

(A) $Y = k_1 \left[1 - \dfrac{k_2 \Delta X}{k_3 X} \right]$

(B) $Y = k_1 \left[1 + \dfrac{k_2 \Delta X}{k_3 X} \right]$

(C) $Y = k_1 \dfrac{k_2 \Delta X}{k_3 X}$

(D) $Y = -k_1 \dfrac{k_2 \Delta X}{k_3 X}$

Q.29 A large set of data for a given measurement has been found to be normally distributed around a mean μ, with standard deviation σ. Which of the following limits would have about 95% of the data points around the mean and rest outside?

(A) $\mu - 0.5\sigma$ and $\mu + 0.5\sigma$

(B) $\mu - \sigma$ and $\mu + \sigma$

(C) $\mu - 2\sigma$ and $\mu + 2\sigma$

(D) $\mu - 3\sigma$ and $\mu + 3\sigma$

Q.30 During fully developed laminar flow in a circular pipe, the velocity profile is parabolic, and symmetric around the axis. The velocity at the tube wall is zero. The ratio of the average velocity to the maximum velocity is

(A) 1/3 (B) 1/2 (C) 2/3 (D) 3/4

Q.31 If k is the rate constant for a reaction and T is the absolute temperature in the given figure, the activation energy for the reaction is
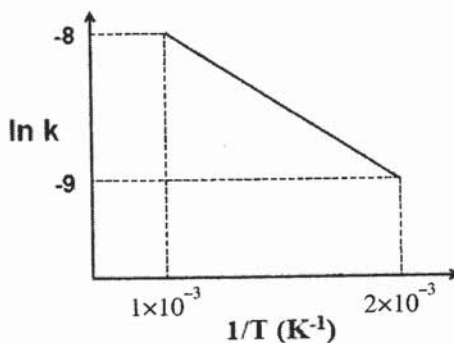
(A) 1000 J/mol (B) 2000 J/mol (C) 4155 J/mol (D) 8314 J/mol

Q.32 $2Cu\,(s) + 0.5O_2\,(g) = Cu_2O\,(s)$ $\Delta G^0 = -162200 + 69.24T$, J

$2Cu\,(l) + 0.5O_2\,(g) = Cu_2O\,(s)$ $\Delta G^0 = -188300 + 88.48T$, J

The molar free energy change at 1300 K for the transformation of solid Cu to liquid Cu will be

(A) 1050 J (B) 960 J (C) 544 J (D) 445 J

Q.33 $Al_2O_3 + 6H^+ + 6e = 3H_2O + 2Al$ $\Delta G^0 = 897.3$ kJ

where, hydrogen ion concentration is unity. The reduction potential of the above reaction under standard state will be

(A) −1.55 V (B) −1.40 V (C) 1.65 V (D) 1.75 V

Q.34 $G = U + PV - TS$

Then which one of the following is **CORRECT**?

(A) $\left(\dfrac{\partial V}{\partial T}\right)_P = \left(\dfrac{\partial S}{\partial P}\right)_T$

(B) $\left(\dfrac{\partial V}{\partial T}\right)_P = -\left(\dfrac{\partial S}{\partial P}\right)_T$

(C) $\left(\dfrac{\partial V}{\partial T}\right)_P = \left(\dfrac{\partial P}{\partial S}\right)_T$

(D) $\left(\dfrac{\partial V}{\partial T}\right)_P = -\left(\dfrac{\partial P}{\partial S}\right)_T$

Q.35 Match the metals in **Group I** with the corresponding ores in **Group II**.

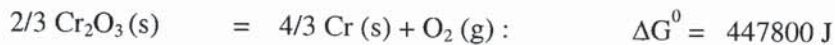| Group I	Group II
P. Lead	1. Columbite
Q. Zinc	2. Cassiterite
R. Uranium	3. Galena
S. Niobium	4. Pitchblende
	5. Sphalerite

(A) P-3, Q-5, R-2, S-4

(B) P-3, Q-2, R-5, S-4

(C) P-3, Q-5, R-4, S-1

(D) P-3, Q-4, R-5, S-2

Q.36 For the following reactions, the standard free energy change is given at 1773 K as follows

$2/3\ Cr_2O_3\,(s) \quad = \quad 4/3\ Cr\,(s) + O_2\,(g): \qquad \Delta G^0 = 447800\ J$

$2\ H_2\,(g) + O_2\,(g) \quad = \quad 2\ H_2O\,(g): \qquad \Delta G^0 = -297000\ J$

If chromium oxide powder has to be reduced by hydrogen in a fluidized bed, the minimum p_{H_2}/p_{H_2O} ratio that has to be maintained at the exit of the reactor is

(A) 8.5   (B) 10.6   (C) 100.2   (D) 166.5

Q.37 The hydrogen content of steel in equilibrium with hydrogen gas at 1 bar pressure is 28 ppm at some temperature. Hydrogen content in the metal at the same temperature gets reduced to 1 ppm, when the equilibrium p_{H_2} changes to

(A) 28 bar   (B) 1/28 bar   (C) $(1/28)^{1.5}$ bar   (D) $(1/28)^2$ bar

Q.38 A furnace wall consists of two layers. The inside layer of 450 mm is made of light weight bricks of thermal conductivity 1 W/m.K and the outside layer of 900 mm is made of refractory of thermal conductivity 2 W/m.K. The hot face of the inside layer is at temperature 1300 K and the cold face of the outer layer is at 400 K. The temperature at the interface between the two layers is

(A) 1000 K   (B) 850 K   (C) 700 K   (D) 600 K

Q.39 Match the heat treatment processes in **Group I** with resultant microstructure of steel in **Group II**.

Group I	Group II
P. Martempering	1. Coarse Pearlite
Q. Normalising	2. Fine Pearlite
R. Subcritical annealing for long time	3. Tempered martensite
S. Full annealing	4. Spheroidised cementite in the matrix of ferrite

(A) P-1, Q-4, R-3, S-2

(B) P-2, Q-3, R-1, S-4

(C) P-4, Q-1, R-2, S-3

(D) P-3, Q-2, R-4, S-1

Q.40 In case of homogeneous nucleation, the critical edge length for a cube shaped nuc̲
(γ: Energy per unit area of the interface between the product and the parent ph̲
Δg : Gibbs free energy change per unit volume)

(A) $-4\gamma/\Delta g$ (B) $-2\gamma/\Delta g$ (C) $\gamma/\Delta g$ (D) $-3\gamma/\Delta g$

Q.41 For a cubic metal with lattice parameter of 3.92 Å, the first four diffraction peaks from the X-ray powder diffraction pattern taken with CuK_α radiation ($\lambda = 1.5405$ Å) occur at 2θ values of 39.7, 46.2, 67.5, and 81.3 degrees. The crystal structure of the metal is

(A) simple cubic   (B) fcc   (C) bcc   (D) diamond cubic

Q.42 The largest size of immobilized segment of dislocation in a Frank Read (FR) source contained in a polycrystalline material is of the order of grain size. In a metal of 10 μm grain size, the shear stress required to operate such a FR source is 100 MPa. If the grain size in the same metal is reduced to 10 nm, the shear stress required to operate such FR source would be

(A) 10^2 MPa   (B) 10^3 MPa   (C) 10^5 MPa   (D) 10^6 MPa

Q.43 Which one of the following reactions in fcc/bcc crystals with lattice parameter 'a' is energetically favorable?

(A) $\frac{a}{2}[\bar{1}10]+\frac{a}{2}[0\bar{1}1]$ (B) $\frac{a}{2}[\bar{1}10]+\frac{a}{2}[\bar{1}10]$

(C) $\frac{a}{2}[111]+\frac{a}{2}[11\bar{1}]$ (D) $\frac{a}{2}[111]+\frac{a}{2}[111]$

Q.44 Match the hardness test methods in **Group I** with the indenter used in **Group II**.

Group I

P. Brinell hardness
Q. Vickers hardness
R. Rockwell C hardness
S. Rockwell B hardness

Group II

1. Brale indenter
2. Square base diamond pyramid
3. 10 mm diameter steel ball
4. 1.6 mm diameter steel ball

(A) P-1, Q-2, R-3, S-4   (B) P-3, Q-2, R-1, S-4
(C) P-1, Q-4, R-3, S-2   (D) P-1, Q-2, R-4, S-3

Q.45 Assertion 'a' : During casting of aluminium, grain refinement can be achieved by addition of certain alloying elements.

Reason 'r' : The addition of the alloying element may result in the formation of deoxidation products or intermetallic compounds which may act as nucleation sites for grain refinement.

(A) Both 'a' and 'r' are true but 'r' is not the reason for 'a'
(B) Both 'a' and 'r' are true and 'r' is the reason for 'a'
(C) 'a' is true but 'r' is false
(D) 'a' is false but 'r' is true

Q.46 Match those listed in **Group I** with the NDT methods listed in **Group II**.

Group I

P. Penetrameter
Q. Differential coil probe
R. Piezo-electric probe
S. Developer

Group II

1. Ultrasonic test
2. Dye-penetrant test
3. X-Ray radiography
4. Acoustic emission test

(A) P-3, Q-4, R-1, S-2
(C) P-1, Q-2, R-4, S-3
(B) P-2, Q-1, R-3, S-4
(D) P-4, Q-3, R-2, S-1

Q.47 Match the manufacturing process of **Group I** to be used for producing the product in **Group II**.

Group I

P. Drawing
Q. Forging
R. Rolling
S. Stretch forming

Group II

1. Large curved disc
2. Tube
3. Crank shaft
4. Plate

(A) P-2, Q-3, R-4, S-1
(C) P-3, Q-2, R-1, S-4
(B) P-1, Q-4, R-3, S-2
(D) P-4, Q-1, R-2, S-3

Common Data Questions

Common data for Questions 48 and 49:

An aluminium billet of 300 mm diameter is extruded with an extrusion ratio of 16.

Q.48 What is the diameter of the final product?

(A) 150 mm
(B) 75 mm
(C) 59 mm
(D) 19 mm

Q.49 What is the ideal extrusion pressure if the effective flow stress in compression is 250 MPa?

(A) 693 MPa
(B) 346 MPa
(C) −346 MPa
(D) −703 MPa

Common data for Questions 50 and 51:

A binary phase diagram of components P and Q displays an eutectoid reaction with terminal solid solutions α on the P rich side and β on the Q rich side. At the eutectoid temperature, the solubilities of Q in α and β are 5 and 90 wt%, respectively. The densities of α and β phases are 9.5 and 2.49 g/cm^3, respectively.

Q.50 At the eutectoid point, the alloy has α and β in the weight ratio 1:1. The eutectoid point occurs at composition

(A) 46 wt % Q
(B) 47.5 wt % Q
(C) 50 wt % Q
(D) 52.5 wt % Q

Q.51 At the eutectoid temperature, the ratio of α and β phases in the specimen observed under microscope is

(A) 0.50
(B) 0.40
(C) 0.25
(D) 0.20

Linked Answer Questions

Statement for Linked Answer Questions 52 and 53:

In an ideal blast furnace, the input and output are as follows:

Input:

Ore : Pure Fe_2O_3, no gangue	:		1357 kg/ THM[#]
Coke : Pure C, no ash	:		400 kg/THM
Blast air : dry :	O_2	:	293 kg/THM
	N_2	:	964 kg/THM
Flux : nil			

Output:

Hot Metal	:	5 wt% C, rest iron
Slag	:	nil
Top gas	:	CO, CO_2, N_2

[#] THM refers to 1 ton hot metal (liquid pig iron); Atomic weights : C-12, O-16, Fe-56

Q.52   The amount of oxygen in CO and CO_2 leaving with the top gas is

(A) 293 kg   (B) 407 kg   (C) 700 kg   (D) 1050 kg

Q.53   The CO/CO_2 molar ratio in the top gas is

(A) 0.9   (B) 1.0   (C) 1.1   (D) 1.5

Statement for Linked Answer Questions 54 and 55:

Shear modulus of copper is 45 GPa. Lattice parameter of copper is 3.61 Å

Q.54   The magnitude of burgers vector in copper is

(A) 2.54 Å   (B) 2.39 Å   (C) 2.20 Å   (D) 2.18 Å

Q.55   The elastic strain energy per unit length of dislocation line in copper is

(A) 34.8×10^{-10} N   (B) 28.8×10^{-10} N   (C) 24.8×10^{-10} N   (D) 14.5×10^{-10} N

General Aptitude (GA) Questions

Q. 56 – Q. 60 carry one mark each.

Q.56 Choose the word from the options given below that is most nearly opposite in meaning to the given word:

Frequency

(A) periodicity
(B) rarity
(C) gradualness
(D) persistency

Q.57 Choose the most appropriate word from the options given below to complete the following sentence:

It was her view that the country's problems had been ——————— by foreign technocrats, so that to invite them to come back would be counter-productive.

(A) identified
(B) ascertained
(C) exacerbated
(D) analysed

Q.58 There are two candidates P and Q in an election. During the campaign, 40% of the voters promised to vote for P, and rest for Q. However, on the day of election 15% of the voters went back on their promise to vote for P and instead voted for Q. 25% of the voters went back on their promise to vote for Q and instead voted for P. Suppose, P lost by 2 votes, then what was the total number of voters?

(A) 100   (B) 110   (C) 90   (D) 95

Q.59 The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair:

Gladiator : Arena

(A) dancer : stage
(B) commuter : train
(C) teacher : classroom
(D) lawyer : courtroom

Q.60 Choose the most appropriate word from the options given below to complete the following sentence:

Under ethical guidelines recently adopted by the Indian Medical Association, human genes are to be manipulated only to correct diseases for which ——————— treatments are unsatisfactory.

(A) similar
(B) most
(C) uncommon
(D) available

Q. 61 to Q. 65 carry two marks each.

Q.61 Given that $f(y) = |y| / y$, and q is any non-zero real number, the value of $|f(q) - f(-q)|$ is

(A) 0   (B) –1   (C) 1   (D) 2

Q.62 Three friends, R, S and T shared toffee from a bowl. R took 1/3rd of the toffees, but return~~ed~~ the bowl. S took 1/4th of what was left but returned three toffees to the bowl. T took hal~~f the~~ remainder but returned two back into the bowl. If the bowl had 17 toffees left, how many to~~ffees~~ were originally there in the bowl?

(A) 38   (B) 31   (C) 48   (D) 41

Q.63 The fuel consumed by a motorcycle during a journey while traveling at various speeds is indicated in the graph below.
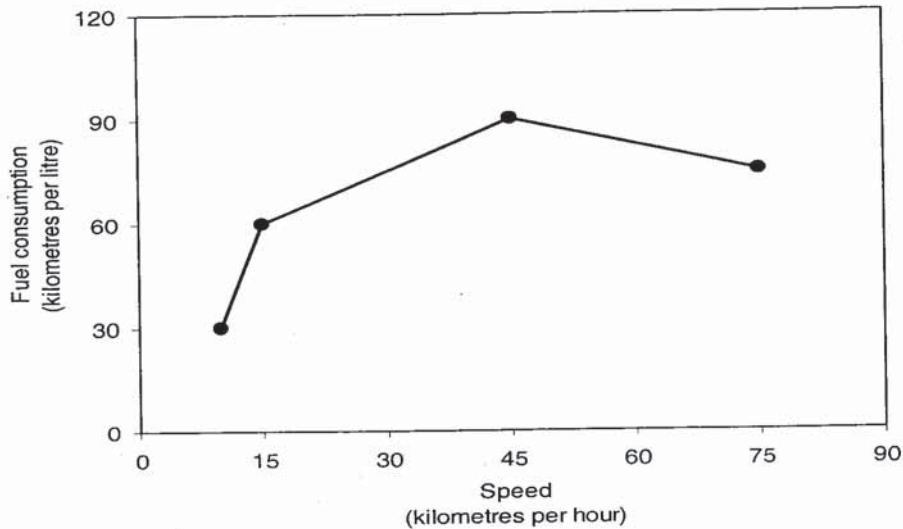
The distances covered during four laps of the journey are listed in the table below

Lap	Distance (kilometres)	Average speed (kilometres per hour)
P	15	15
Q	75	45
R	40	75
S	10	10

From the given data, we can conclude that the fuel consumed per kilometre was least during the lap

(A) P   (B) Q   (C) R   (D) S

Q.64 **The horse has played a little known but very important role in the field of medicine. Horses were injected with toxins of diseases until their blood built up immunities. Then a serum was made from their blood. Serums to fight with diphtheria and tetanus were developed this way.**

It can be inferred from the passage, that horses were

(A) given immunity to diseases
(B) generally quite immune to diseases
(C) given medicines to fight toxins
(D) given diphtheria and tetanus serums

Q.65 The sum of n terms of the series 4+44+444+.... is

(A) $(4/81) [10^{n+1} - 9n - 1]$
(B) $(4/81) [10^{n-1} - 9n - 1]$
(C) $(4/81) [10^{n+1} - 9n - 10]$
(D) $(4/81) [10^{n} - 9n - 10]$

END OF THE QUESTION PAPER

GATE 2011 - Answer Key - Paper : MT

Paper	Question no.	Key		Paper	Question no.	Key
MT	1	D		MT	41	B
MT	2	D		MT	42	C
MT	3	A		MT	43	A
MT	4	D		MT	44	B
MT	5	C		MT	45	B
MT	6	C		MT	46	A
MT	7	B		MT	47	A
MT	8	A		MT	48	B
MT	9	A		MT	49	A
MT	10	D		MT	50	B
MT	11	B		MT	51	C
MT	12	D		MT	52	C
MT	13	B		MT	53	B
MT	14	B		MT	54	A
MT	15	C		MT	55	D
MT	16	D		MT	56	B
MT	17	A		MT	57	C
MT	18	B		MT	58	A
MT	19	A		MT	59	D
MT	20	A		MT	60	D
MT	21	C		MT	61	D
MT	22	C		MT	62	C
MT	23	A/C		MT	63	B
MT	24	D		MT	64	A
MT	25	D		MT	65	C
MT	26	D				
MT	27	A				
MT	28	C				
MT	29	C				
MT	30	B				
MT	31	D				
MT	32	C				
MT	33	A				
MT	34	B				
MT	35	C				
MT	36	D				
MT	37	D				
MT	38	B				
MT	39	D				
MT	40	A				