

# **GATE – Mining Engineering**

**(Topic Wise Questions 2007-2017)**

**Topic: Mining Machinery**

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## **GATE SYLLABUS:**

**Mining Methods and Machinery:** Surface mining: layout, development, loading, transportation and mechanization, continuous surface mining systems; Underground coal mining: bord and pillar systems, room and pillar mining, longwall mining, thick seam mining methods; Underground metal mining : open, supported and caved stoping methods, stope mechanization, ore handling systems, mine filling.

Generation and transmission of mechanical, hydraulic and pneumatic power; Materials handling: haulages, conveyors, face and development machinery, hoisting systems, pumps

# 2007

Q.8 In a centrifugal flow fan the conversion of velocity pressure to static pressure is accomplished with the help of

- (A) impeller                      (B) curved blades                      (C) hub                      (D) casing

Q.12 The ratchet-and-pawl arrangement in percussive drill machine helps in

- (A) providing required rotational speed  
(B) indexing at the bit rock interface  
(C) regulating air flow in forward and return strokes of the piston  
(D) engaging the bit with the rock between the blows

Q.22 The cost of diesel is Rs.  $\left(25 + \frac{x}{90}\right)$  per km to drive a dump truck at a speed of  $x$  km/hour. The maintenance cost of the truck is Rs. 10 per hour. To minimize the cost per km, the truck speed in km/hour is

- (A) 5                      (B) 20                      (C) 25                      (D) 30

Q.32 Match the following

	Belt conveyor component		Function
P	Pull cord	1	Cleaning device
Q	Snub pulley	2	Discharging material on the side of the conveyor
R	Tripper	3	Safety stopping device
S	Rotary brush	4	Increasing the angle of wrap

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

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

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

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

Q.33 Match the following

	Equipment		Action / Process
P	Dragline	1	Reaming
Q	Bucket wheel excavator	2	Key cut
R	Tunnel boring machine	3	Pulsating impact
S	Hydraulic monitor	4	Terracing

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

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

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

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

Q.35 A 15 yd<sup>3</sup> dragline is deployed in an overburden bench of an opencast mine. It works for 40 days at the rate of 6 hours per shift and 3 shifts a day. The cycle time, bucket fill factor, and operating efficiency of the dragline are respectively 50 s, 0.8, and 75%. The total volume of overburden in m<sup>3</sup> handled by the dragline is (1 yd<sup>3</sup> = 0.765 m<sup>3</sup>)

(A) 356918

(B) 634521

(C) 557685

(D) 991440

Q.38 In an opencast mine, a centrifugal pump is required to lift water at the rate of 60 l/s to a height of 80 m above the pump level. The vertical suction head is 4 m. The total friction head including shock and energy loss is 10 m. If the pump runs at an efficiency of 80%, the brake power of the motor in kW is

(A) 70.50

(B) 67.50

(C) 63.00

(D) 57.55

Q.40 Match the following

Stope	Drill machine	Method of drilling
P Shrinkage	I Drill jumbo	1 Fan drilling
Q Room-and-pillar	J Down-the-hole hammer	2 Overhand drilling
R Sublevel	K Hand held stopper	3 Parallel drilling
S Sublevel caving	L Mechanised fan drill	4 Frontal /vertical/downward benching

(A) P-I-2, Q-K-4, R-L-3, S-J-1

(C) P-K-2, Q-I-4, R-J-3, S-L-1

(B) P-K-4, Q-I-3, R-J-2, S-L-1

(D) P-I-3, Q-K-4, R-J-1, S-L-2

Q.42 Two reservoirs are connected by two equal length parallel pipelines with diameters  $d$  and  $2d$ . Assuming similar resistance coefficients, if the discharge through the smaller diameter pipeline is  $0.04 \text{ m}^3/\text{s}$ , the discharge through the other pipeline in  $\text{m}^3/\text{s}$  is

(A) 0.226

(B) 0.426

(C) 1.130

(D) 1.280

Q.44 A 12 tonne diesel locomotive of 60 kW is plying in an underground haulage roadway. The coefficient of adhesion is 0.25 and the maximum gear efficiency is 80%. The speed in m/s at which it will haul a train at its full power is

(A) 2.548

(B) 2.448

(C) 2.038

(D) 1.630

Q.48 Match the following

System	Device/ Safety device
P Drum winding	1 Taper guide
Q Koepe winding	2 Detaching safety hook
R Inclined Haulage	3 Rider
S Winding in sinking shaft	4 Back catch

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

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

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

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

**Statement for Linked Answer Questions 78 & 79:** A double outboard chain stranded conveyor is installed in an underground coal mine to transport coal. The mass of the chain and associated flight is 40 kg/m, the coefficients of kinematic friction are 0.33 between chain and the pan and 0.5 between conveyed coal and the pan. The motor efficiency is 80%. Coal is to be conveyed at the rate of 120 t/hour over a length of 120 m at a chain speed of 0.9 m/s. The bulk density of coal is 900 kg/m<sup>3</sup>.

- Q.78 The power requirement of the motor of the chain conveyor in kW is
- (A) 33.16                      (B) 37.53                      (C) 42.00                      (D) 45.94
- Q.79 The power requirement of the motor of the chain conveyor in kW, if it moves in the uphill direction at a gradient of 1 in 10, is
- (A) 46.91                      (B) 42.00                      (C) 38.53                      (D) 30.16

**Statement for Linked Answer Questions 80 & 81:** The observed total time of drilling a face in an underground coal mine is 18 min. The rating of the drill crew performance, expressed in percentage, is 90. Following allowances are recommended by the mine management

- i) personal needs allowance: 5% of the basic time
- ii) fatigue allowance: 4% of basic time
- iii) contingency delay allowance: 1% of basic time

- Q.80 The basic time required for the drilling job by the crew in min is
- (A) 16.2                      (B) 17.4                      (C) 18.0                      (D) 20.0
- Q.81 The standard time required for the same drilling job by the crew in min is
- (A) 15.50                      (B) 17.01                      (C) 17.82                      (D) 18.90

**2008**

- Q.3 The tool used to correct borehole deviation is
- (A) String shot                      (B) Kelly                      (C) Whipstock                      (D) Ratchet

Q.7 During over-winding, a cage is safely suspended in the headgear due to

- (A) Bull chain  
(C) D-link

- (B) Rope capel  
(D) Detaching hook

Q.22 Match the following:

Equipment	Slice thickness (range in m)	Action
P Dragline	1 6 - 12	a Crowding
Q Shovel	2 30 - 40	b Hoisting
R Surface Miner	3 0.2 - 0.4	c Cutting

- (A) P-1-b; Q-2-a; R-3-c  
(C) P-2-a; Q-1-b; R-3-c

- (B) P-2-b; Q-1-a; R-3-c  
(D) P-2-b; R-1-a; Q-3-c

Q.23 If the value of ore is Rs. 600 per tonne, production cost Rs. 400 per tonne, and cost of overburden removal Rs. 50 per m<sup>3</sup>, the break-even stripping ratio in m<sup>3</sup>/tonne is

- (A) 4:1                      (B) 3:1                      (C) 1:3                      (D) 1:4

Q.30 Match the following:

Access	Haulage	Mineralisation location
P. Shaft	1. Track	a. Moderate depth
Q. Decline	2. Trackless	b. Deep seated
R. Adit	3. Hoisting	c. Hillock

- (A) P-1-a, Q-3-b, R-2-c  
(C) P-2-a, Q-1-b, R-3-c

- (B) P-3-b, Q-2-a, R-1-c  
(D) P-2-b, Q-3-c, R-1-a

Q.31 Match the following:

Mining method	Operation
P Bord and Pillar	1 Longhole radial drilling
Q Sublevel caving	2 Splitting and slicing
R Longwall retreating	3 Loosening under strata pressure
S Integrated Caving	4 Mechanical cutting

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

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

- Q.37 A drum winder of radius 2.5 m draws a power of 308 kW when the maximum rope speed is 7 m/s. The RMS torque in kNm is
- (A) 55 (B) 76 (C) 110 (D) 144
- Q.38 A belt conveyor conveys material of average cross-sectional area of  $0.09 \text{ m}^2$ , of bulk density  $1.5 \text{ tonne/m}^3$ , at a speed 2 m/s. The carrying capacity of the belt in tonne/hr is
- (A) 972 (B) 864 (C) 732 (D) 643
- Q.47 The coefficient of friction between the tub-wheel and haulage track is  $1/\sqrt{3}$ . For the applicability of direct haulage, minimum inclination (in degrees) of track is
- (A) 60 (B) 55 (C) 35 (D) 30
- Q.63 A conveyor of rated power 100 kW hauls coal up-dip at 30 kg/s along an inclination of  $15^\circ$  and distance 300m. Heat added by the conveyor to the air in kW is
- (A) 56.4 (B) 65.9 (C) 77.2 (D) 82.3
- Q.68 In a coal handling plant wagons of 8m length are loaded, at rake travel speed of 0.48 km/hr. The chute loading rate is 6000 tonne/hr. As the rake moves continuously, the chute stops for a total of 24s in between two wagons. The quantity of coal in tonne loaded in each wagon is
- (A) 52 (B) 60 (C) 76 (D) 94

**Statement for Linked Answer Questions 84 and 85:** A loco of mass 10000 kg has a coefficient of adhesion to the tracks as 0.25. The loco offers a running resistance equal to 10% of its weight.

- Q.84 The draw-bar-pull generated by the loco on a level ground in kN is
- (A) 11.3 (B) 14.7 (C) 15.8 (D) 17.2
- Q.85 The draw-bar-pull generated by the loco when the upward gradient of the track is  $5^\circ$  in kN is
- (A) 6.16 (B) 7.9 (C) 9.5 (D) 11.5

## 2009

- Q.12 Koepe system of winding does NOT include
- (A) tapper guide (B) limit switches (C) safety hook (D) brake







# 2010

Q.16 Recapping a winding rope is done to

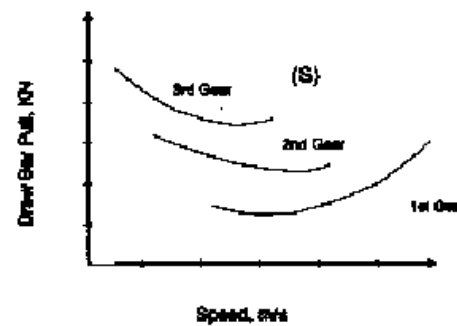
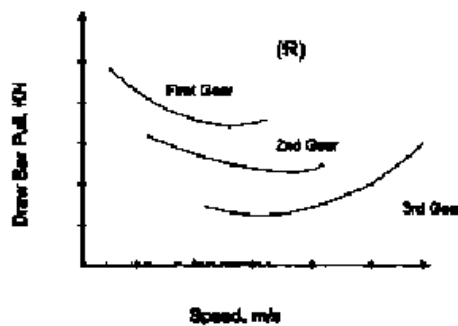
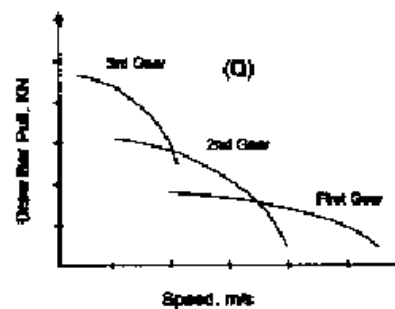
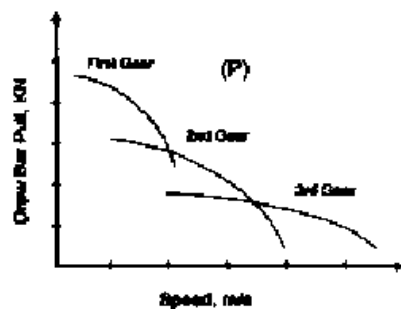
- (A) increase the flexural strength of the rope
- (B) increase the flexibility of the rope
- (C) remove a portion of the rope subjected to deterioration
- (D) prevent the rope from excessive rusting

Q.17 Match the following for standard diamond drill rods.

Specification	Outer Diameter in mm
P. AW	p. 34.9
Q. BW	q. 44.4
R. EW	r. 54.0
S. NW	s. 66.7

- (A) P-r; Q-q; R-s; S-p
- (B) P-r; Q-p; R-s; S-q
- (C) P-q; Q-r; R-p; S-s
- (D) P-q; Q-r; R-s; S-p

Q.25 The relationship between the drawbar pull and the speed for different gears of a self propelling vehicle is represented by

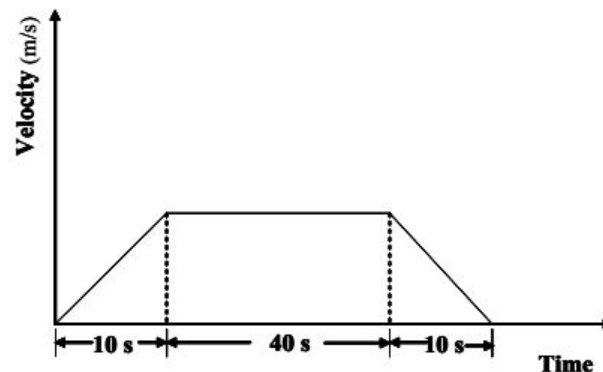


- (A) Q
- (B) S
- (C) R
- (D) P

- Q.28 A balanced winder raises 3000 tonnes per day from a depth of 500 m. The payload of the winding cage is 7 tonnes. The energy consumed per day in kWh at 70% winder efficiency is  
 (A) 6030 (B) 5840 (C) 5750 (D) 5630
- Q.44 A steel wire rope of 25 mm diameter weighing 37 N/m has 6 strands of 7 wires each. The diameter and tensile strength of each wire are 2.5 mm and 1800 MPa, respectively. The factor of safety for raising a cage of weight 60 kN from a depth of 200 m is  
 (A) 5.60 (B) 4.50 (C) 4.25 (D) 4.15
- Q.46 The stroke length and pitch of the rifle bar of a percussive drill machine are 60 mm and 1/760 respectively. If the drill operates at 2000 blows/minute, the rotational speed in rpm of the drill steel is  
 (A) 145 (B) 158 (C) 162 (D) 175

## 2011

- Q.6 A drive shaft of an engine develops torque of 500 N-m. It rotates at a constant speed of 50 rpm. The power transmitted by the shaft in kW is  
 (A) 1.46 (B) 2.05 (C) 2.62 (D) 4.32
- Q.7 A mine winder cage traveling 450 m from pit bottom to pit top is following a three period duty cycle as shown in the figure below. The maximum velocity attained by the cage in m/s is



- (A) 7.5 (B) 9.0 (C) 11.0 (D) 12.0
- Q.14 According to mine regulations, the value of the fleet angle  $\alpha$ , in degree of a drum winder installation lies in the range of  
 (A)  $1.5 < \alpha \leq 2.0$  (B)  $0 < \alpha \leq 1.5$  (C)  $2.0 < \alpha \leq 2.5$  (D)  $2.5 < \alpha \leq 3.0$
- Q.15 Water will not be delivered by a centrifugal pump due to  
 (A) lack of priming (B) too low discharge head  
 (C) wrong direction of rotation (D) partial obstruction at discharge outlet

Q.16 Match the following

Mine car type	Mode of unloading
P. Granby	1. Bottom opening
Q. Gable bottom	2. Both side tilting
R. Drop bottom	3. Single side opening
S. Rocker dump	4. Both side opening

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

Q.22 The time study data of an equipment deployed in a mine during a calendar month is given below.

Total working hours = 400  
Total maintenance hours = 100  
Total hours of actual work = 240

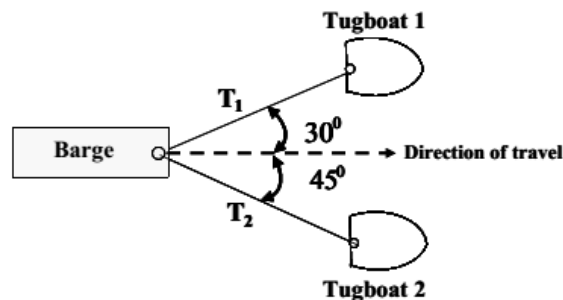
The percentage of utilization of the equipment is

- (A) 85                      (B) 80                      (C) 65                      (D) 60

Q.24 A longwall face cut by double back shuffle method can be only worked with

- (A) fixed drum shearer                      (B) single ended ranging drum shearer  
(C) double ended ranging drum shearer                      (D) plough





Q.31 In an iron ore handling port, a barge is pulled by ropes using two tugboats as shown in the figure. In equilibrium, the resultant of the forces  $T_1$  and  $T_2$  along the axis of the barge in the direction of its travel is 5000 N. The tensions  $T_1$  and  $T_2$  in N respectively are



- (A) 9700 and 6831                      (B) 6831 and 9700  
(C) 3660 and 2588                      (D) 2588 and 3660

- Q.32 A flat belt conveyor is carrying coal of bulk density  $1 \text{ tonne/m}^3$  at a rate of  $400 \text{ tonne/h}$ . The belt speed is  $3 \text{ m/s}$ . Coal is spread over the belt covering  $80\%$  of the belt width in a shape of a triangle. If the pile height is  $1/4$  of the belt width, the width of the belt in mm is
- (A) 1109                      (B) 909                      (C) 709                      (D) 609

Q.33 Match the following.

Hydraulic system components		Symbols
P Fixed displacement unidirectional flow pump	1	
Q Fixed displacement unidirectional flow motor	2	
R Accumulator	3	
S Filter	4	

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

## 2012

- Q.10 As per the Indian Electricity Rules 1956, the maximum permissible length of a flexible cable used with an electric rope shovel in m is
- (A) 100                      (B) 200                      (C) 300                      (D) 500
- Q.11 The equipment that is NOT used in hard rock metal mining drivage is
- (A) road header                      (B) drill jumbo  
 (C) jack hammer                      (D) dint header
- Q.13 Equipment used in mining of placer deposits is
- (A) auger                      (B) wagon drill                      (C) rope saw                      (D) riffle box
- Q.14 A dump truck powered by  $350 \text{ kW}$  engine is running at a speed of  $35 \text{ km/h}$ . Considering the transmission efficiency of the truck as  $85\%$ , the rim pull of the truck in kN is
- (A) 21                      (B) 31                      (C) 41                      (D) 51

- Q.18 When a double ended ranging drum shearer cuts coal in a longwall face,
- (A) both the drums rotate in the same direction keeping the front drum up and the rear drum down
  - (B) both the drums rotate in the opposite direction keeping the front drum up and the rear drum down
  - (C) both the drums rotate in the opposite direction keeping the front drum down and the rear drum up
  - (D) both the drums rotate in the same direction keeping the front drum down and the rear drum up
- Q.20 Continuous miner and shuttle car combination is NOT applicable in mining with
- (A) rib pillar extraction technique
  - (B) Wangawilli system
  - (C) room and pillar method
  - (D) longwall method
- Q.27 A shearer is deployed in a mine where the specific energy consumption for cutting coal is  $800 \text{ kJ/m}^3$ . The specific gravity of coal is 1.2. If the machine produces 700 te/h, the electrical power consumption in kW of the shearer at 65% motor efficiency is
- (A) 149.4                      (B) 199.4                      (C) 219.4                      (D) 239.4
- Q.32 Match the following:

	<b>Equipment</b>		<b>Component</b>
P	Scraper	1	Dribble belt
Q	Dragline	2	Dipper stick
R	Bucket wheel excavator	3	Fair lead
S	Rope shovel	4	Bowl

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

- Q.33 The torque in N-m of a winder motor is described by the relationship  $T = 1450 - 3.2\omega$ , where,  $\omega$  is the angular speed of the motor in rad/s. If the shaft is rotating at a speed of 1450 rpm, the power of the motor in kW is
- (A) 112.4                      (B) 146.4                      (C) 184.4                      (D) 212.4

Common Data for Questions 50 and 51:

The following data are provided for a surface mine to be excavated by a shovel:

Production target	: 10000 te/shift
Available hours per shift	: 6 hrs
Shovel loading cycles per hour	: 106
Bank density of the material mined	: 2400 kg/m <sup>3</sup>
Swing factor at 120° swing	: 0.91
Bucket fill factor	: 0.64
Utilization of available time	: 83%
No of working days in a year	: 300
No of shifts per day	: 3

- Q.50 The annual production target in Mte is  
(A) 5.76 (B) 7.00 (C) 8.19 (D) 9.00
- Q.51 The size of bucket of the shovel in m<sup>3</sup> is  
(A) 5.55 (B) 9.33 (C) 11.22 (D) 13.55

## 2013

- Q.10 The rotational speed and cutting velocity of a drill are 350 rpm and 71.50 m/min respectively. The diameter of the rotary drill bit in mm is  
(A) 65 (B) 67 (C) 68 (D) 70
- Q.13 Among the following options, the specific energy for rock-drilling is lowest in  
(A) rotary diamond drilling  
(B) rotary roller drilling  
(C) percussive drilling  
(D) jet piercing
- Q.17 Under standard temperature and pressure conditions the theoretical maximum height in m to which water can be lifted using an air-lift pump is  
(A) 10.33 (B) 9.61 (C) 7.45 (D) 6.05
- Q.18 In a belt conveyor system, function of the snub pulley is to  
(A) clean the inner surface of the belt  
(B) clean the outer surface of the belt  
(C) increase the angle of contact of belt with drive drum  
(D) decrease the belt tension





Q.38 Given the following,

<b>Machine</b>	<b>Component</b>
P. Dint header	1. Cowl
Q. Coal plough	2. Cutting chain
R. Road header	3. Loading apron
S. Shearer	4. Static set of bits

the correct match is

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

Q.44 Given the following,

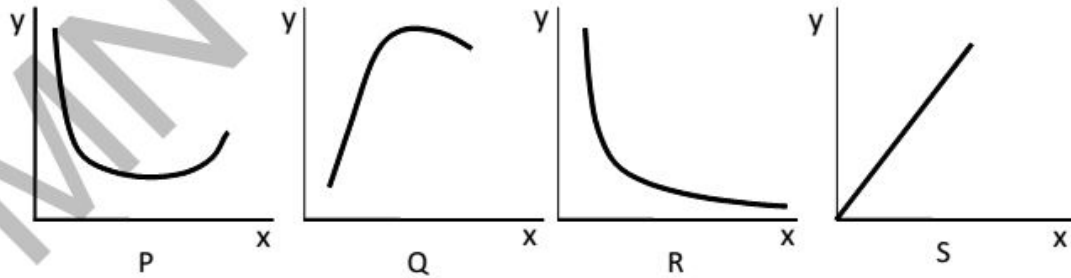
<b>Excavating/loading machine</b>	<b>Transportation scheme</b>
P Bucket Wheel Excavator	1 Mine tub
Q Continuous Miner	2 Armoured flexible chain conveyor
R Shearer	3 Shiftable Conveyor
S Load Haul Dumper	4 Shuttle car

the correct match is

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

2014

Q.34 The following characteristic curves (P, Q, R, S) pertain to rotary drilling in rock.



Title of the curve

- I: Torque versus RPM
- II: Rate of penetration versus uniaxial compressive strength of rock
- III: Rate of penetration versus weight on bit
- IV: Specific energy versus weight on bit

Match the curves with their titles

- (A) P-III, Q-IV, R-II, S-I
- (B) P-II, Q-IV, R-I, S-III
- (C) P-IV, Q-III, R-II, S-I
- (D) P-I, Q-III, R-II, S-IV

- Q.40 A centrifugal pump has a discharge rate of 2000 L of water per min against a total head of 200 m. If the pump efficiency is 75%, the input power to the pump in kW is  
 (A) 87.20 (B) 49.05 (C) 13.33 (D) 7.50
- Q.41 A dragline is required to remove 3,00,000 m<sup>3</sup> of rock per month on the bank volume basis. Consider the following data for the dragline operation.  
 Effective working hours per month = 450  
 Bucket fill factor = 0.8  
 Cycle time = 65 s  
 Swell factor of the rock = 1.25  
 The minimum bucket capacity of the dragline in m<sup>3</sup> is  
 (A) 7.70 (B) 9.63 (C) 12.04 (D) 18.80
- Q.42 A direct rope haulage pulls 8 tubs loaded with coal through an incline of length 500 m having an inclination of 1 in 6. Consider the following additional data.  
 Capacity of tub = 1.0 tonne  
 Tare weight of tub = 500 kg  
 Hauling speed = 9 km per hour  
 Coefficient of friction between wheel and rail = 1/60  
 Coefficient of friction between rope and drum = 1/10  
 Mass of rope per meter = 1.5 kg  
 The minimum power required to haul the tubs in kW is  
 (A) 345.50 (B) 348.60 (C) 350.10 (D) 365.50
- Q.54 The failure and the repair rates of a shovel are 0.06 hr<sup>-1</sup> and 0.04 hr<sup>-1</sup> respectively. The availability of the shovel in percentage is \_\_\_\_\_

## 2015

Question Number : 15 Question Type : MCQ

In a drum hoisting system through a vertical shaft, overwinding is prevented by

- (A) Lilly controller
- (B) detaching hook
- (C) caliper brake
- (D) safety catch

Options :

- 1. ✖ A
- 2. ✔ B
- 3. ✖ C
- 4. ✖ D

Question Number : 32 Question Type : MCQ

In a fully mechanised bord and pillar mining system, winning of coal and its transportation from the face is commonly carried out with the combination of

- (A) continuous miner, shuttle car, feeder breaker and belt conveyor
- (B) continuous miner, LHD, feeder breaker and chain conveyor
- (C) continuous miner, SDL, feeder breaker and belt conveyor
- (D) continuous miner, shuttle car, feeder breaker and chain conveyor

Options :

- 1.  A
- 2.  B
- 3.  C
- 4.  D

Question Number : 38 Question Type : MCQ

In a shortwall panel, coal is extracted from the face by a continuous miner having rate of production 30 tonne/h. Coal having specific gravity of 1.4 is transported by shuttle cars of capacity  $0.9 \text{ m}^3$  each to a feeder breaker located at 60 m from the face. If the average speed of the LHD is 0.5 m/s, and total loading and unloading time of LHD is 40 s, the number of LHDs required to match the production of the continuous miner is

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

Options :

- 1.  A
- 2.  B
- 3.  C
- 4.  D

Question Number : 48 Question Type : NAT

A single-acting reciprocating pump delivers  $0.018 \text{ m}^3/\text{s}$  of water when running at 45 cycles per minute. The piston diameter is 300 mm and stroke length is 400 mm. The volumetric efficiency of the pump in % is \_\_\_\_\_

Correct Answer :

83 to 87

Question Number : 64 Question Type : NAT

A coal seam of 2 m thickness is extracted by a longwall retreating panel with face length of 120 m. Web depth of the shearer is 0.6 m. Average manpower in the longwall face in a shift is 20. The specific gravity of in-situ coal is 1.4. If the shearer makes 4 full-face cuts in 3 shifts, the face OMS in tonne is \_\_\_\_\_

Correct Answer :

13 to 14

Question Number : 65 Question Type : NAT

A loaded dumper of total mass 75 tonne, having wheel diameter 1250 mm, runs on a haul road which offers an average specific rolling resistance of 260 N/tonne. The engine develops an axle torque of 15 kN-m. The starting acceleration of the dumper in  $\text{m/s}^2$  is \_\_\_\_\_

Correct Answer :

0.055 to 0.065

## 2016

Q.15 Which one of the following ropes CANNOT be an effective cable bolt?

- (A) locked coil wire rope
- (B) Langs lay wire rope
- (C) ordinary lay wire rope
- (D) bird-caged wire rope

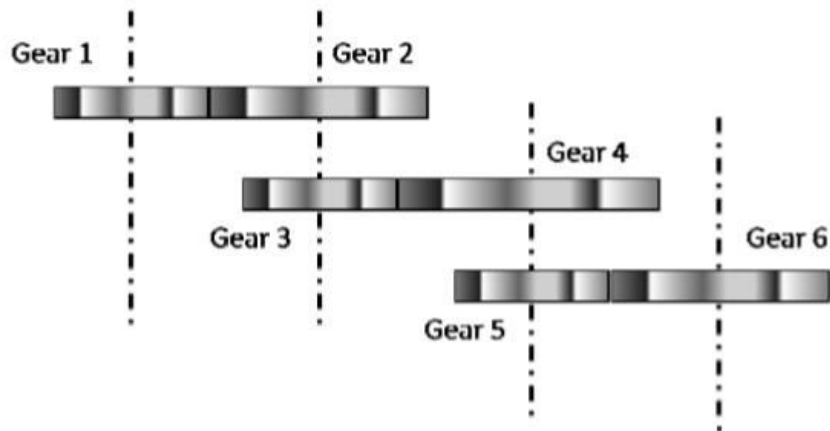
Q.41 A skip of 10 tonne capacity hoists ore through a 1000 m deep shaft at a speed of 20 m/s. The skip accelerates and decelerates at  $2.0 \text{ m/s}^2$ . The loading and unloading times for the skip are 2.5 min and 1.5 min, respectively. The maximum hourly capacity of the hoisting system, in tonnes, is \_\_\_\_\_

Q.42 Match the following:

Haulage unit	Safety device
P. Friction winder	1. Run-away switch
Q. Drum winder	2. Lilly controller
R. Direct rope haulage	3. Regenerative braking
S. Endless rope haulage	4. Monkey/back catch

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

Q.43 In the gear assembly shown, the rpm of Gear 1 is 600. The number of teeth in Gear 1, Gear 2, Gear 3, Gear 4, Gear 5 and Gear 6 is 30, 45, 15, 20, 10 and 30, respectively. The rpm of Gear 6 is \_\_\_\_\_



Q.45 From an openpit sump, mine water is lifted using a 250 m long straight pipeline laid along a gradient of  $34^{\circ}$ . The pumping rate is 500 gpm (1 gallon = 3.8 litres). Additional head loss due to pipe friction can be considered to be 10% of head lifted. At an overall efficiency of 70%, the electric power consumed by the pump, in kW, is \_\_\_\_\_.

- Q.54 A surface mine has 15 identical dumpers and two shovels. For shovel 1, the dumper cycle time is 30 min and the shovel loading time is 5 min. For shovel 2, the dumper cycle time is 32 min and the shovel loading time is 4.0 min. Based on match factor optimisation (equitable match factor), the ideal allocation of dumpers to shovel 1 and shovel 2, respectively is
- (A) 6, 9                      (B) 7, 8                      (C) 9, 6                      (D) 8, 7

**2017**

**Question Number : 23**

**Correct : 1 Wrong : 0**

A double ended ranging drum shearer is employed in a longwall mine of face length 150 m. The mining height is 3.5 m and depth of the web cut is 0.76 m. The cycle time for unidirectional cutting is 40 min. Considering bulk density of the coal to be  $1.4 \text{ t/m}^3$ , hourly production from the face in tonne is \_\_\_\_\_

**Question Number : 24**

**Correct : 1 Wrong : -0.33**

The strength of a stranded wire rope is proportional to

- (A) the diameter of the rope
- (B) square of the diameter of the rope
- (C) square root of the diameter of the rope
- (D) inverse of the diameter of the rope

**Question Number : 47**

**Correct : 2 Wrong : 0**

The discharge rate of a water pump is  $0.25 \text{ m}^3/\text{s}$ . The diameter of the discharge and suction nozzles are 300 and 350 mm respectively. The measured pressure at the discharge end located 0.25 m above the centerline of the impeller is  $150 \text{ kN/m}^2$  and the pressure at the suction gage located at the centre line of the impeller is  $20 \text{ kN/m}^2$ . Specific weight of water is  $9810 \text{ N/m}^3$ . The total dynamic head for the above installation in m is \_\_\_\_\_



**Question Number : 52**

**Correct : 2 Wrong : 0**

A 1.1 m wide belt conveyor carries materials of bulk density  $1.35 \text{ t/m}^3$  at a speed of  $1.75 \text{ m/s}$ . The average cross-sectional area of material is equal to  $w^2/11$ , where  $w$  is the width of the belt in m. The carrying capacity of the conveyor in t/h is \_\_\_\_\_

