WEST BENGAL UNIVERSITY OF TECHNOLOGY

AUE-802A

OFF ROAD VEHICLE

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. $10 \times 1 = 10$

(i) In dragline "fair lead" carries-

(A) bucket hoist rope (B) boom hoist rope
(C) bucket drag rope (D) bucket drag chain

(ii) Swell factor is usually

(A) zero (B) one
(C) less than one (D) more than one

(iii) During operation of dragline, the boom is inclined at

(A) 30° to the horizontal (B) 45° to the horizontal
(C) 60° to the horizontal (D) any angle to the horizontal

(iv) The main equipment used for pulling and pushing other equipment is

(A) bull dozer (B) scraper
(C) tractor (D) power shovel

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(v) Modern dozer steering is achieved by

(A) rack and pinion mechanism
(B) differential gear mechanism
(C) hydraulic steering clutch mechanism
(D) mechanical steering clutch mechanism

(vi) Which is the correct?

(A) dozer blade can be rotated about vertical axis
(B) grader blade can be rotated about vertical axis
(C) both (A) & (B)
(D) none of these

(vii) Dumpers are

(A) rear wheel driven only (B) all wheel driven only
(C) both (A) & (B) (D) front wheel driven only

(viii) Which component is not present in the dragline?

(A) bucket (B) boom
(C) dipper stick (D) hoist rope

(ix) Which one is correct?

(A) struck capacity = heaped capacity
(B) struck capacity > heaped capacity
(C) struck capacity < heaped capacity
(D) struck capacity can't be compared with heaped capacity

(x) Dog clutch helps in

(A) steering of shovel only
(B) steering and marching of shovel
(C) swinging of shovel super structure
(D) none of these

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GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. Draw with neat sketch of hydraulic control mechanism of dozer blade.

3. Draw and explain with neat sketch of dragline bucket and its function.

4. A shovel discharges material on a dumper of 35 Ton capacity.
How much time is required to fill the dumper? If the shovel is having the following parameter.
Bucket capacity = 4.6 cum, cycle time = 38 sec, Bucket fill factor = 0.75.
Bulk density of the materials 1.5 ton/cum.

5. Discuss with neat sketch the walking mechanism of dragline.

6. Describe the construction features of dozer and grader blade.

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. A dragline having 24/36 specification operates in coal mine under the following conditions
   - Average life of dragline 15 years
   - Power rating 1500 KVA
   - Lubrication cost is 25% of power cost
   - Repair cost is 80% of depreciation cost
   - Cycle time 65 sec
   - Bucket fill factor is 0.65
   - Purchase power is Rs. 15 crore
   - Wage of operator Rs. 1 lakh per month
   - Insurance cost of the machine Rs. 15 lakh per year
   - Tax of the dragline is Rs. 550 per day
   - Power cost Rs. 5 per KWH

   - Utilization factor 0.7
   - Bulk density of the material is 1.8 T/cum
   - Rate of interest = 15%

   The dragline operates 3 shifts per day for 340 days per year.
   Calculate the cost per ton of materials extracted.

8. (a) Explain with a neat sketch the deck layout of an electric shovel.
   (b) Draw and explain the kinematic diagram of swing mechanism of electric shovel.

9. Draw and explain the power flow diagram of road grader driving wheel.

10. (a) Explain with neat sketch the transmission system of Diesel shovel.
   (b) The power shovel employed in Mines has bucket capacity of 14500000 cm^3. It extracts from muck-pile and the shovel operates as follows:
   Filling the bucket (Fb): 0.4 min
   Swing maneuvering (Sm): 14 secs
   Returning maneuvering (Rm): 12 secs
   Dumping (Du): 0.6 min
   Operating Time: 360 mins/Shift
   No of Shift: 3 shift/day
   Operating days/year: 312 days/year
   Bucket fill factor is 0.8
   Availability factor: 0.90
   Utilization factor: 0.85
   Hence, determine:
   (i) Total cycle time;
   (ii) Number of duty cycle per shift;
   (iii) Productivity per day of the power shovel;
   (iv) Annual Productivity.

11. Write short notes on any *two* of the following: 7.5×2
   (a) Dozer power transmission system.
   (b) Hydraulic system used in dumper.
   (c) Discuss the maintenance activities to be followed during starting of a dragline at the start of a day.