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Paper Code : AUE-802A

OFF ROAD VEHICLE

Time Allotted : 3 Hours *Full Marks* : 70

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. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) Dragline travels on

a) forward direction only

b) backward direction only

c) sidewise direction only

d) none of these.

ii) Dragline is specified by

a) bucket capacity only

b) boom length only

c) bucket capacity and boom length

d) none of these.

iii) Shovel bucket discharges materials through

a) overturning the bucket

b) bottom portion of the bucket

c) side portion of the bucket

d) front portion of the bucket.

iv) High capacity dump body is

a) rectangular section body

b) deep V-shaped body

c) both (a) and (b)

d) none of these.

v) Crowd mechanism performs

a) lifting of bucket

b) forcing the bucket against the virgin soil

c) marching of shovel

d) steering of shovel.

vi) Shape of the dozer blade is usually

a) horizontally curved blade

b) vertically curved blade

c) can be both (a) and (b)

d) straight blade (no curve).

vii) Pump used by the hydraulic circuit of grader is

a) Reciprocating pump

b) Centrifugal pump

c) Gear pump

d) Vane pump.

viii) A dozer operates in down the gradient, its capacity

a) remains the same as in level ground

b) increases than on level ground

c) decreases than on level ground

d) cannot be compared.

ix) Grader is usually mounted on

a) Crawler assembly b) Wheel assembly

c) Rail mounted d) Walking shoe.

x) Allusion transmission system uses

a) torque converter, cone clutch, bevel gear system

b) torque converter, cone clutch, epicyclic gear system

c) torque converter, retarder, epicyclic gear system

d) all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Discuss the inspections required to be followed during starting of a shift for dragline.

3. A dragline has bucket capacity 15 cu.m. The machine operates in the following condition :

   Average utilization is 85% with cycle time 60 second and bucket fill factor 65%.

   Calculate the daily output of the dragline, if it operates 3 shifts per day. Assume any other data.

4. Describe with a neat sketch the deck layout of an electric shovel, indicating clearly the motor specifications.

5. A dozer blade has dimensions 4315 mm × 1785 mm. Calculate the capacity of the dozer when it operates on down the gradient of 7%. Deduce any expression you have used.

6. Explain with a neat diagram the circuit of a hydraulically operated grader.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. Describe with neat sketch the walking mechanism of dragline.

8. a) A shovel of 4·6 cu m capacity is employed in a project. Estimate the capacity of dumpers required for the purpose having the following particulars :

   Dumpers to be filled up by five passes

   Bucket fill factor 75%

   Bulk density of material 1·7 t/cu.m

   Payload of 25 t dumper is 22,680 kg

   Payload of 35 t dumper is 31,752 kg

   Payload of 50 t dumper is 45,360 kg.

   b) What are the different types of bodies used in dumpers ? Describe them with neat sketches. 8 + 7

9. A dragline having 15/90 specification working in a coal mine having the following particulars :

   Average life of dragline 15 years

   Dragline is 1000 kVA machine

   Lubrication cost is 25% of power cost

   Repair cost is 80% of depreciation cost

Cycle time 65 sec

Bucket fill factor 0·65

Purchase price of dragline is Rs. 10 crore

Salary and wages Rs. 50,000 per month

Insurance cost of the machine is Rs. 20 lakh/year

Tax for entire life of the machine is Rs. 25 lakh

Number of shift per day = 3

Number of working days per year = 350

Power cost = Rs. 5 /kWh

Utilization factor 0·7

Bulk density of the material 2 ton/m^3

Interest rate 15%.

Calculate the cost per ton of materials extracted. Assume any data, if you require.

10. a) A dozer blade having dimensions 4315 mm × 1875 mm operates on level ground. The average speed of the dozer is 10 kmph. What would be the hourly output of dozer, if the materials are to shifted over a distance of 50 m ? Assume that the cutting length to be 50 m.

    b) Explain with a neat sketch the blade operation circuit of a hydraulically operated dozer. 10 + 5

11. The following particulars refer to an electric shovel :

Bucket capacity = 4·6 cu m

Average life = 10 years

Power = 500 kVA

Lubrication cost = 12% of power cost

Repair cost = 60% of depreciation cost

Cycle time = 34 sec

Bucket fill factor = 75%

Purchase price = Rs. 2·00 crore

Operator's salary etc. = Rs. 20,000 per month

Insurance cost = Rs. 4 lakh per year

Interest = 15%

Power cost = Rs. 5/kWh

Calculate the extraction cost per cu.m of material excavated. Assume any other data.