



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH/AUE/SEM-8/AUE-813/2013**

**2013**

**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) Overload clutch is used in electric shovel for
    - a) Swing mechanism
    - b) Crowd mechanism
    - c) Travel mechanism
    - d) Hoist mechanism.
  - ii) Main pump of dozer hydraulic circuit uses
    - a) Reciprocating pump
    - b) Centrifugal pump
    - c) Vane type pump
    - d) Gear pump.
  - iii) Retarder works on the principle of
    - a) Energy dissipation in the form of frictional work
    - b) Energy dissipation in the form of kinetic energy variation
    - c) Energy dissipation by churning the fluid
    - d) None of these.



- iv) Grader is usually mounted on
  - a) Crawler assembly      b) Wheel assembly
  - c) Walking shoe      d) Rail.
- v) Dragline is specified by
  - a) Bucket capacity only
  - b) Boom capacity only
  - c) Power capacity of prime mover
  - d) both (a) & (b).
- vi) Which is not a component of shovel ?
  - a) Boom      b) Bucket
  - c) Fair lead pulley      d) Dipper stick.
- vii) Apron is a component of
  - a) Shovel      b) Dragline
  - c) Scraper      d) Dozer.
- viii) When dozer operates in an inclined ground, its capacity
  - a) may increase
  - b) may decrease
  - c) remains the same as in level ground
  - d) both (a) & (b).
- ix) Steering of dozer is achieved by
  - a) Rack and pinion mechanism
  - b) Sector gear mechanism
  - c) Hydraulic steering clutch mechanism
  - d) none of these.
- x) Bucket fill factor value is usually
  - a) Zero      b) One
  - c) Less than one      d) More than one.



**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. A dumper receives materials from a shovel of 1.91 cu.m capacity. The dumper is filled by 8 passes of shovel. Shovel cycle time is 18 sec. The dumper discharges the materials to a distance of 2 km. away from the receiving spot. The average speed of the dumper is 18 kmph. Calculate the carrying capacity of the dumper per hour, if bulk density of the material is 1.7 T/cu.m and bucket fill factor is 0.8.
3. A dragline having specification of 15/90 operating in a project under the following conditions :  
Dragline operates 3 shifts per day, and 350 days per year. Average utilization is 85% with 65 sec cycle time. Bucket fill factor is 65%. Calculate annual extraction capacity of the dragline.
4. A dozer blade having dimension 4315 mm × 1875 mm operates in up the gradient of 5%. What would be output of dozer, if the bulk density of the material is 1.27 T/cu.m ?
5. Obtain the expression of production cost per ton of material excavated by shovel in terms of various parameters.
6. Explain with neat sketch the hydro air suspension system of Dumper.

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. A dozer blade having dimension 4315 mm × 1875 mm operates on level ground. The average speed of dozer is 10 kmph. The materials are to be shifted over a distance of 50 m. Assuming depth of cut to be 10 cm, calculate the time,



requir to complete the job of cutting 50 m. length. Show the cutting plan with sketch and consider forward and reverse shifting time separately.

8. A dragline having specification of 24/96 operates in a project having the following particulars :
- Average life of dragline 15 yrs.
  - This is 1000 kVA machine.
  - Lubrication cost 25% of power cost.
  - Repair cost – 80% of depreciation cost
  - Cycle time – 65 sec.
  - Bucket fill factor 0.65
  - Purchase price Rs. 10 Crore
  - Wage of operators etc. Rs. 50,000/- per month
  - Insurance cost Rs. 20 lacs per year
  - Tax for entire life Rs. 15 lacs
  - Working on 3 shifts/day for 350 days per year.
  - Power Cost Rs. 5.0/kWh.
  - Utilization factor 0.7
  - Bulk density of the material is 2T/cu.m
  - Bank interest 15%.
- Calculate the cost per ton of materials extracted by the dragline.
9. Explain with neat sketch the hydraulic contral circuit of scraper used in open cast project.
10. Explain with neat sketch the operation of travel mechanism for electric shovel. Discuss how steering is achieved.
11. Draw the deck layout of a dragline showing the position(s) of different mechanisms and discuss the function.