MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : AUE-604A

VEHICLE BODY ENGINEERING

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) Meaning of 5th percentile is

a) 5% of total population with larger size than remaining 95%

b) 5% of total population with smaller size than the remaining 95%

c) none of these

d) may be all of these.

ii) Brake pedal position of the vehicle should be

a) 5th percentile of knee length of driver

b) 50th percentile of knee length of driver

c) 95th percentile of knee length of driver

d) none of these.

iii) Gull wing door is

a) side hinged door

b) top hinged door

c) sliding door

d) bottom hinged door.

iv) Magnitude of driving wheel torque is ..... than engine torque.

a) less b) greater

c) equal d) cannot be compared.

v) Maximum tractive effort in a 4 speed gear box vehicle is available in the

a) 1st gear b) 2nd gear

c) 3rd gear d) 4th gear.

vi) In double decker bus, passengers are not allowed to stand on the top deck because

a) passenger ventilation is affected

b) overall centre of gravity of the bus changes

c) upper deck floor can be collapsed

d) none of these.

vii) Aerodynamic force on vehicle depends on

a) road gradient

b) wheel speed

c) frictional force between tyres & road

d) none of these.

viii) The propellant of an automobile air bag contains

a) sodium azide and potassium nitrate

b) potassium chlorate and nitric acid

c) sodium carbonate and water

d) lead peroxide and sulphuric acid.

ix) Folding seat is used in

a) Hatch back car

b) Multi-utility vehicle

c) Saloon car

d) Sports car.

x) Wheel base of Limousine car is

a) less than the wheel base of saloon car

b) equal to the wheel base of saloon car

c) greater than the wheel base of saloon car

d) all of these.

GROUP – B

(Short Answer Type Questions)

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

2. Explain wind tunnel with a suitable sketch.

3. Explain with a neat sketch the fluid control door used in luxury bus.

4. List the various types of body surface damages of a vehicle. Explain the repair procedure of the damaged surface.

5. Write different safety aspects of a vehicle.

6. Why is window regulator used ? Describe with neat sketch the rope pulley operated window regulator of passenger car.

GROUP – C
(Long Answer Type Questions)

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

7. A vehicle is provided with six pillars (three on each side). The outer dimension of the pillars are 60 mm × 50 mm having wall thickness 1 mm. The 50 mm side is placed in lateral direction and 60 mm side is placed in longitudinal direction of the vehicle. The vehicle is travelling at 120 kmph. Brakes are applied to stop the vehicle in 90 sec. The total weight of the vehicle is 2000 kg and roof load is 150 kg. Assume the entire roof load and load during braking are shared equally by the pillars.

   Calculate normal and shear stress developed on the central pillar of the vehicle. Assume length of central pillar as 1200 mm and the pillars are of uniform cross-section. Assume any reasonable data.

8. Design and draw the interior layout of a hatch back car with 4 + 1 seat mounted on 4 wheel of 315 mm diameter. The following must be considered :

   a) Seat arrangement

   b) Inner length, width and height

   c) Overall height of vehicle

   d) A dimensioned sketch showing all the details.

   Use of standard physical dimension (in mm) enclosed in Table-1 (given on page no. 7) is permitted.

9. a) Draw the sketch of passenger car door and label different zones.

   b) List the different sliding mechanisms of door glass pane. Explain with neat sketch the operation of mechanically operated mechanism. 6 + 9

10. a) Explain the construction and working principle of Air bag with a suitable sketch.

    b) Write its advantages and disadvantages.

    c) The drag coefficient of a car at the design conditions of 1 atm at 25°C and 90 km/h is to be determined experimentally in a large wind tunnel in a full-scale test. The height and width of the car are 1.40 m and 1.65 m, respectively. If the horizontal force acting on the car is measured to be 300 N, determine the total drag coefficient of this car.

    8 + 2 + 5

11. Write short notes on any *three* of the following : 3 × 5 = 15

    a) Collapsible steering column

    b) Automotive body painting

    c) Visibility

    d) Effect of aerodynamic drag with change of body profile.

Body Position	STANDING					
	MEN			WOMEN		
	5th Percentile	50th Percentile	95th Percentile	5th Percentile	50th Percentile	95th Percentile
Stature	1660 5' - 4"	1751 5' - 7"	1861 6' - 1"	1519 5' - 00"	1625 5' - 3"	1731 5' - 6"
Shoulder height	1323	1427	1530	1219	1324	1429
Elbow height	1006	1089	1171	912	993	1073
Eye height	1526	1639	1752	1400	1508	1616
Finger tip height	601	660	719	542	559	657
SITTING						
Elbow rest height	195	239	284	188	299	270
Shoulder height	549	604	658	516	570	624
Eye height	745	805	865	691	746	800
Sitting height	857	915	973	796	854	913
Thigh Clearance	127	152	177	104	139	174
Buttock knee Length	548	597	645	525	577	628
Knee height	500	546	591	460	502	543
Sitting stool height	371	415	549	341	382	423
Shoulder breadth	420	462	504	374	419	464
Hip breadth	321	360	400	319	377	434