Quiz Keys 2025

Question 1

AIP

Which is the correct statement regarding the Anti-Intrusion Plate (AIP)?

○ All AIP designs using one of the "standard" FSAE IAs are exempted from carrying out physical tests.

○ The AIP is not part of the primary structure.

○ The AIP fixation to the Front Bulkhead can not be made by smaller than 8 mm fasteners.

● Blind insert can be used for the fixation of the AIP to the Front Bulkhead.

Question 2

Pitch stiffness

Your team just participated in the auto-cross event, you are now preparing the car for the endurance event and your Chief Aero Engineer remarks that you have much more grip than expected and take a lot of pitch, hence losing downforce. He asks you (Suspension Engineer) to increase the pitch stiffness of the car. Unfortunately, you can only change the springs of each axle and the Performance Engineer wants you to keep the same stiffness balance in order to keep the drivers happy. Taking into account tyre stiffness, what spring do you choose for the front and rear axle to keep the same balance of stiffness ($=k_{AxleF}/(k_{AxleF}+k_{AxleR})$) rounded to 0.1%?

- Car mass (including driver and liquids) = 275kg
- Static Weight balance (including driver and liquids) = 45% front
- Car center of gravity height = 350mm
- Motion ratios (= Wheel displacement / Spring displacement) = 1.1 front, 1.15 rear
- Tyre vertical stiffness = 80 N/mm (front and rear)
- Springs on the car during the autocross: Front = 42 N/mm, rear = 72 N/mm
- Springs at your disposal:
Front = 40, 42, 44, 46 N/mm
Rear = 70, 72, 74, 76 N/mm

- ○ Front: 40 N/mm, Rear: 70 N/mm

- ○ Front: 46 N/mm, Rear: 76 N/mm

- ● Front: 44 N/mm, Rear: 76 N/mm

- ○ Front: 44 N/mm, Rear: 74 N/mm

Question 3

Endurance time

Your team just finished the endurance. Well done.

The first driver had run their round in 820 seconds.

They have almost made a perfect run, but with a few DOOs:

- 2 cones counted as "DOO" in the second lap

- 3 cones counted as "DOO" in the fourth lap

The driver change was 200 seconds long.

The second driver had run their round in 940 seconds.

They made some errors:

- they totally missed a slalom with 4 gates.

- they forgot to drive into the slow lane after a Blue Flag was shown.

What is your corrected elapsed endurance time?

○ 1850 s

○ 1830 s

○ 1910 s

○ 1890 s

● 1860 s

○ 1880 s

Question 4

Maximum low voltage power

Calculate the maximum power you can draw from your low-voltage battery. Your battery has an open-circuit-voltage of 12 V and an internal resistance of 20 mΩ. (Assume a constant ohmic load)

- ○ 600W
- ○ 7200W
- ● 1800W
- ○ 3600W
- ○ 240W

Question 5

Brake test

What is incorrect regarding the brake test procedure?

○ The vehicle must remain in a straight line under braking until the complete stop.

○ Teams can use an old a set of tyres equal to the ones they are planning to use for dynamic events.

◉ The run is validated if the BOTS has been triggered during the brake test but the driver has been able to reset it to make the vehicle exit the area under its own power.

○ A single brake could be used for one axle

Question 6

Helicopter

A helicopter is flying horizontally at a constant speed. A perfectly flexible and uniform cable is suspended beneath the helicopter. Air friction on the cable is not negligible. Which of the following diagrams best represents the shape of the cable as the helicopter flies through the air towards the right?

(A)

(B)

(C)

(D)
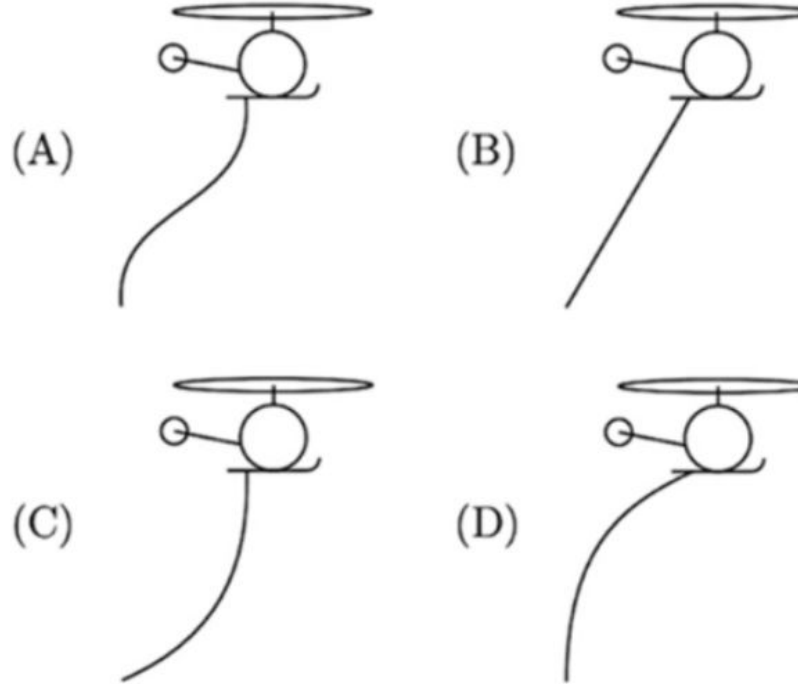
○ D

○ A

○ C

● B

Question 7

Tyre change

During the endurance, the conditions are announced damp, but the weather is quite unstable and you think that the situation may change during the event.

Which of the following assumptions is correct?

- ⦿ You start with dry tyres, if the condition stays damp: You can change to wet tyres during the driver change

- ○ You start with wet tyres, if the condition changes to dry and you have a nail in a tyre, thus damaging it, at same time: You have to replace the deflated tyre

- ○ You start with wet tyres, if the condition stays damp: You can change to dry tyres during the driver change.

- ○ You start with dry tyres, if the condition changes to dry during the drive : You can change to wet tyres during the driver change but the time to change the tyres will be added to total time.

Question 8

Fire extinguishers

Which and how many fire extinguishers are necessary for each team?

○ Three foam-type extinguishers are required.

○ Two CO2-type extinguishers are required.

◉ Two foam-type extinguishers are required.

○ Two extinguishers are required, one of which has to be foam-type.

Question 9

Lap belt

What setup regarding the lap belt is not permitted?

◉ In side view the lap belt is at an angle of 70° to the horizontal, with the seat back inclined 65° from horizontal

○ In side view the lap belt is at an angle of 65° to the horizontal, with the seat back inclined 55° from horizontal

○ The lap belt is part of a SFI Specification 16.5 harness manufactured in 2024

○ The centerline of the lap belt at the seat bottom is 5mm rearward of the seat back to seat bottom junction, with the seat back inclined 40° from vertical

Question 10

Brake piston

As a new team member, you've been given the following exercise

For next year's project, we are planning to use one dual piston (one on each side) caliper for each one of the two rear brakes. We already have a caliper in mind and we want you to double-check our choice.

With the given information, calculate the minimum piston diameter/bore D in order to lock the rear wheels during the brake test?

Somes reminders and simplifying considerations:

- No regenerative braking can be used during brake tests.
- We will not consider losses on transmission etc. and only consider the torque coming from the brake system.
- We will not consider the wheel's inertia.

To account for all simplifications, a safety factor of 15% is added to the brake force.

Input data:
- Tyre Rolling Radius = 0.203 m
- Tyre Friction Coefficient = 1.6
- Static Weight distribution = 45% on the Front and 55% on the Rear
- Total Mass (car + pilot) = 290 kg
- Deceleration during Brake test = - 1.2g
- Gravity = 9.81 m/s²
- CG height = 0.226 m
- Wheelbase = 1.525 m
- Disc Effective Radius = 0.088 m
- Disc/Pad Friction Coefficient = 0.45
- Number of pistons per calliper = 2
- Number of rear axle brake disks = 2
- Saftey factor = 1.15
- Pressure in the rear brake line = 2482000 Pa

Which of the following piston diameters would be the smallest suitable for our project in order to lock the rear wheels during the brake Test?

○ 25.4 mm

○ 38.1 mm

● 36.0 mm

○ 31.8 mm

Question 11

ED scoring FSA

How many points can you score in the Engineering Design Event for your overall vehicle concept at FSA?

○ Overall vehicle concept will not be judged at FSA

○ A maximum of 20 points can be obtained for the overall vehicle concept

◉ Overall vehicle concept will be judged at FSA, but no maximum points are defined

○ A maximum of 10 points can be obtained for the overall vehicle concept

Question 12

All the powertrains at FSA

How many listed powertrain options are possible at FS Austria 2025?

- ○ 2
- ○ 7
- ● 6
- ○ 5
- ○ 3
- ○ 4