

武汉理工大学考试试卷 (B 卷)

Test Paper of Wuhan University of Technology (B)

2018-2019 Academic Year 1st Semester, Course: Automotive Structure A
(Bilingual), Closed-book Exam

Time: 120mins, 64 class hours, 4 credits, Total Points: 100, Percent in final evaluation result: 60%, Date: 2017/xx/xx

No.	I	II	III	IV	V						Total
Full score	10	10	10	40	30						100
Score	8	9	3	28	23						71

得分	81
Score	

I. Fill in the blanks (1 point *10=10 points)

- There are two types of cylinder liners (气缸套): 干式气缸套 and 湿式气缸套.
- Compared with petrol engine, the diesel engine has the merits of good economy, high reliability and 环保, so all heavy-duty vehicles are powered by diesel engines.
- The friction plate-type clutch is composed of four parts: the active part (主动部分), the driven part (从动部分), the 压紧部分 and the control mechanism (操纵机构).
- The suspension (悬架) is generally composed of three parts, i.e. elastic element (弹性元件), guide device (导向装置) and 减振器.
- The automobile braking system generally includes at least two separate braking units (制动系统), one is service brake (行车制动) used in ordinary driving, and the other is 驻车制动.
- The firing order of four-stroke six-cylinder engine is 压缩冲程 or 做功冲程.
- Main functions of the engine lubrication system include lubrication (润滑), 清洗, cooling (冷却), sealing (密封) and rust protection (防锈).
- The automobile transmission system is mainly composed of clutch (离合器), transmission (变速器), universal joint (万向传动装置), 传动轴, differential (差速器) and half axle (半轴).
- Front wheel alignment includes four parameters: kingpin caster (主销后倾), kingpin inclination (主销内倾), 前轮外倾 and toe-in of front wheel (前轮前束).
- The seal ring (密封圈) of the piston of disc-type wheel brake (盘式制动器) has two functions: return of piston after brake is released and 密封制冷却.

得分	
Score	

II. True or false questions (1 point *10=10 points)

- (X) Non-independent suspensions (非独立悬架) are widely used in the front suspension of passenger cars because of their simple structure and reliable operation.
- (✓) The piston crown (活塞顶) is a part of the combustion chamber, the piston head (活塞头部) is mainly used to install the piston ring, and the piston skirt (活塞裙部) can play a guiding role.
- (X) Valve clearance (气门间隙) refers to the clearance between valve (气门) and valve seat (气门座).
- (X) When the excess air coefficient (过量空气系数) α is 1, both in theory and in fact, the combustion of gas mixture is most complete and the economy of the engine is the best.
- (X) When filling lubricating oil (润滑油), the more the oil is, the better for the engine.
- (X) Double-plate clutch has two discs, two pressure plates and two friction surfaces.
- (X) The suspension (悬架) of all vehicles contains elastic component (弹性元件).
- (X) Ply rating of tires means the actual number of plies (帘布层).
- (X) The best braking state is the critical state when the wheels are completely locked and skid.
- (✓) The free stroke of steering wheel (转向盘自由行程) helps absorb road shocks, smoothen the manipulation and decrease driver's excessive tension.

得分	
Score	

III. Multiple choices (single answer, 1 point *10=10 points)

- (A) Which speed leads to the lowest fuel consumption?
A. low speed; B. medium speed; C. full speed; D. over speed.
- (A) The four stroke of the four stroke engine is
A. Induction, compression, power and exhaust
B. Induction, compression, power and scavenging
C. Air exchange, compression, work and scavenging
D. Air exchange, compression, work and exhaust
- (C) Which kind of gas mixture has the lowest fuel consumption rate?
A. $\alpha=1.05\sim1.15$ B. $\alpha=1$ C. $\alpha=0.85\sim0.95$
- Which one is not the advantage of two-stroke engines (B)
A. Running smoothly B. High power per liter C. Compactness D. Low pollution
- (B) When the clutch is fully engaged, the first shaft of the transmission
A. doesn't rotate; B. rotates at a speed different from that of the engine;
C. rotates at the same speed with that of the engine.
- Steering wheels swing around (C).
A. steering knuckle B. kingpin; C. front beam; D. frame
- The designation of the diesel brand is based on the (D).
A. evaporation B. ignition C. viscosity D. freezing point

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8. The pressure force of the diaphragm spring (膜片弹簧) is C when the wear of the driven disc becomes thin.

- A. Bigger B. Smaller C. Almost the same D. Disappear

9. The friction plate-type clutch is composed of four parts: the active part, the driven part, the pressure assembly and C.

- A. disengaging lever; B. flywheel; C. control mechanism; D. clutch cover

10. C Which is the function of the transmission system?

- A. steering; X B. braking; X C. interrupting power transmission; D. vibration reduction

得分	
Score	22

IV. Short-answer questions (6 points * 5 = 30 points)

1. To achieve the purpose of constant-angular-velocity drive (等角速度传动), what requirements should be met for common cross-axle rigid universal joint (十字轴刚性万向节)?

答: (1) 第一个十字轴刚性万向节两轴夹角等于第二个十字轴刚性万向节两轴夹角;
 (2) 第一个十字轴万向节从动叉与第二个十字轴万向节从动叉在同一平面内。

2. Why need a clutch (离合器机构) mounted in the starter (起动机)? List several types of clutches usually used in starter.

答: 原因: 由动机带动启动后, 发动机转速大于由动机转速, 会损坏由动机, 因此如果加装保护装置可以避免损失。

类型:

2'

3. What is the natural frequency of the suspension (悬架的固有频率)? What factors is it related to?

答: 悬架的固有频率即悬架的自振频率, 用 n 代表字母为 n ,
 则 $n = \frac{1}{2\pi} \sqrt{\frac{C}{m}}$, C 为悬架刚度, m 为簧载质量。

悬架的固有频率影响因素: (1) 悬架刚度; 悬架刚度越小, 则固有频率越小, 但是悬架刚度变形力会增大; (2) 簧载质量; 簧载质量越大, 则固有频率越小。

5'

4. What parameters are there for steering wheel alignment (车轮定位)? What's the function of each parameter?

答: 车轮定位参数有: ① 前轴主销后倾角; ② 主销内倾角; ③ 前轮外倾角; ④ 前轮前束。原理: 由地面侧压力产生的回力矩与车轮转向相反, 产生了回正作用, 形成回正力矩。

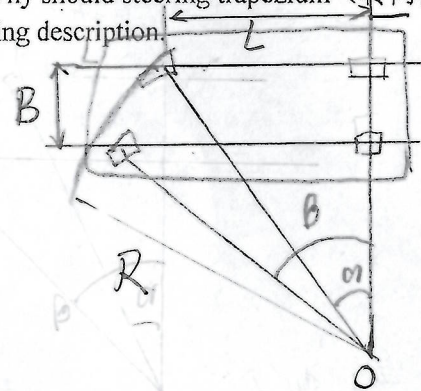
作用: ① 前轴主销后倾角: 力图使转弯后的车轮自动回正; ② 主销内倾角: 使重力产生回正作用; ③ 减小驾驶员转向所用的力, 驾驶轻便; ④ 主销前倾角。

③ 前轮外倾角: 防止汽车满载时外倾; 减小轮胎磨损; 减小前轮后轴的外负荷。

④ 前轮前束: 减小前轮外倾时带来的滑动。

5'

5. Why should steering trapezium (转向梯形) be installed in vehicle steering system? Write Ackerman equation, and drawing description.



O 为转向中心, 转向半径为 R ,
 当转向半径为 R 时, 外轮转向角为 α , 此时转向半径为 R 。
 当 α 取最大值 α_{max} 时, R 有最小值 R_{min} 。

$$R_{min} = \frac{L}{\sin \alpha_{max}}$$

L — 两轴间距, B — 两轮间距;
 外轮转向角为 α , 内轮转向角为 β 。

$$\cot \beta = \cot \alpha + \frac{B}{L}$$

5'

