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26 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	10	9	8	22	17						66

得分	
Score	16

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

- There are two types of cylinder liners (气缸套): 湿缸套 and 干缸套.
- 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 压紧机构 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 1-4-2-6-3-5 or 1-5-3-6-2-4.
- Main functions of the engine lubrication system include lubrication (润滑), cleaning, 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), 主减速器, 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), 车轮外倾 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 实现间隙自调.

得分	
Score	

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

- ☒ 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.
- ☒ Valve clearance (气门间隙) refers to the clearance between valve (气门) and valve seat (气门座).
- ☒ 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.
- ☒ When filling lubricating oil (润滑油), the more the oil is, the better for the engine.
- ☒ Double-plate clutch has two discs, two pressure plates and two friction surfaces.
- ☒ The suspension (悬架) of all vehicles contains elastic component (弹性元件).
- ☒ Ply rating of tires means the actual number of plies (帘布层).
- ☒ 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)

- ☒ Which speed leads to the lowest fuel consumption?
A: low speed; B. medium speed; C. full speed; D. over speed.
- ☒ 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
- ☒ 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 ()
A. Running smoothly B. High power per liter C. Compactness D. Low pollution
- ☒ 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 ().
A. steering knuckle B. kingpin; C. front beam; D. frame
- ☒ The designation of the diesel brand is based on the ().
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 () 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 ().

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

10. () Which is the function of the transmission system?

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

得分	
Score	17

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)?

① ~~转动轴~~ 转动轴

① 传动轴两端的叉位于同一平面内。

② 每个联轴器上的传动角相等。

2'

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

目的: 使发动机启动时, 将主动齿轮与电枢轴相连, 启动发电机。

在发动机转速大于电枢轴转速时, 断开连接, 防止主动齿轮转速

电动机超速。

类型: ① 惯性啮合式

② 强制啮合式

③ 电磁推动式

2'

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

固有频率 = $1 \sim 1.6 \text{ Hz}$

① 与悬架刚度 k 有关。刚度减小, 固有频率减小, 但刚度会增大。

② 与弹簧质量有关。质量增大, 固有频率减小。

3'

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

① 主销内倾角

② 主销后倾角

③ 车轮外倾。

④ 前轮前束。

作用 ① 主销后倾角产生一个回正力矩。

② 主销内倾, 转向时让车身位置上移, 靠重力产生一个回正力矩。

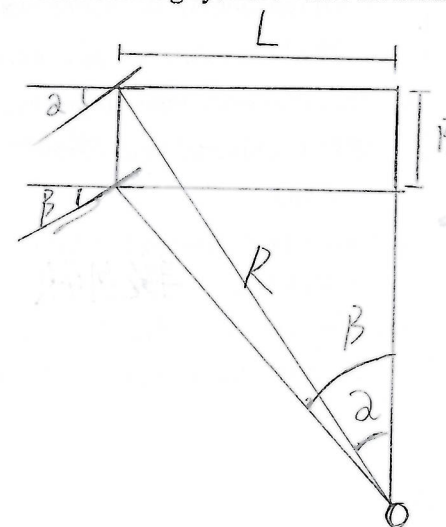
③ 车轮外倾: 使主销偏置距减小, 路面不平, 操纵容易。在地面法向力有侧向力, 外倾防止车轮侧滑脱落。路面凸起产生的侧向力与外倾产生的外倾推力相抵消。

④ 前轮前束, 消除外倾引起的圆锥效应, 防止车轮横向滑动, 而加大车轮磨损。

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

转向梯形由左右梯形臂和转向横拉杆组成。

转向梯形为了防止转向车身侧倾过大, 便于控制转向半径与转向中心位置。



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

$$R = \frac{L}{\sin \alpha}$$

4'

