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Bihar Engineering University, Patna
End Semester Examination - 2022

Course: B.Tech.	***Semester: VII***	***Time: 03 Hours***
Code: 102705	***Subject: AUTOMOBILE ENGINEERING.***	***Full Marks: 70***

Instructions:-

(i) The marks are indicated in the right-hand margin.
*(ii) There are **NINE** questions in this paper.*
*(iii) Attempt **FIVE** questions in all.*
*(iv) Question No. **1** is compulsory*

Q.1 ***Choose the correct answer of the following: (Answer any seven)*** **[2 x 7 = 14]**

(a) The power to weight ratio of diesel engine compared to petrol engine:
- I. High
- II. Low
- III. Same
- IV. Not comparable

(b) A universal joint allows the propellor shaft to
- I. Change inclination
- II. Change length
- III. Bend side ways
- IV. Transfer torque at an angle

(c) Camber should generally lie in the range
- I. Less than 1 degree
- II. Between 1 and 2 degree
- III. Between 2 and 4 degree
- IV. Around 7 to 8 degree

(d) The torque converter uses _____ to transfer torque.
- I. Air
- II. Automatic transmission fluid (ATF)
- III. Gears
- IV. Steel belt

(e) The function of anti-lock brake system (ABS) is that is
- I. Reduce the stopping distance
- II. Minimise the brake fade
- III. Maintains directional control during braking by preventing the wheels from locking
- IV. Prevents nose dive during braking and thereby postpones locking of the wheels

(f) The component that connects the steering rack to the knuckles is
- I. Tie-rod
- II. Sector gear
- III. Pivot
- IV. Spline

(g) The process of supplying the intake air to the engine cylinder at a density greater than the density of the surrounding atmosphere is known as
- I. Supercharging
- II. Scavenging
- III. Polymerization
- IV. Detonation

(h) In a single dry plate clutch, torsional vibrations are absorbed by
- I. Coil springs known as torsional springs
- II. Cushion springs
- III. Central hub
- IV. Clutch pedal

P.T.O.

(i) The chassis in which engine is mounted completely inside the driver's cabin is called

I. Conventional control chassis
II. Semi-forward control chassis
III. Full-forward control chassis
IV. None of the above

(j) The aspect ratio (expressed in percentage) of the tyre is defined as the ratio of

I. Section height to section width
II. Wheel diameter to section height
III. Wheel diameter to section width
IV. Section width to section height

Q.2 (a) What is common rail direct injection (CRDI) system? How is it different from conventional injection system? [7]

(b) Differentiate between transistor-based coil ignition system and capacitive discharge ignition system. [7]

Q.3 (a) Sketch and explain the working of an electromagnetic clutch in an automobile. [7]

(b) Sketch and explain the working of synchromesh gearbox. [7]

Q.4 (a) What are the factors to be considered for the design of an ignition system? What are the advantages of capacity discharge ignition? [7]

(b) A spark ignition engine on test consumes 5 kg/h of petrol when running on an air fuel ratio of 16:1. The engine uses a single-jet carburettor having a fuel orifice are of 2 sq. mm and the tip of the jet is 5 mm above the level of petrol in the float chamber, when the engine is not running. Calculate the depression in the venture throat to maintain the required fuel flow rate through the carburettor. Assume specific gravity of petrol as 0.75 and the coefficient of discharge of the fuel orifice as 0.8 . What area of venture throat will be required to maintain desired flow rate? Density of air is 1.20 kg/m^3 and the coefficient of discharge for venture throat is 0.8. Neglect compressibility of air. [7]

Q.5 (a) With a neat sketch, explain the construction and working of air operated brake system. Write its advantages over other brakes. [7]

(b) What is the principle of vacuum brake? [7]

Q.6 (a) What are the main constituents of exhaust emissions from diesel engines? Give the possible routes of their formation. [7]

(b) With the help of diagram, discuss the working of a '3-way catalytic convertors'. [7]

Q.7 (a) Explain the use of lubricating system and its part in automobile engine. [7]

(b) A 4-stroke petrol engine with compression ratio 6.5:1 and total piston displacement 5200 cc develops 135 BHP and consumes 33 kg of petrol/hr of the calorific value 10,560 kcal/kg at 3000 r.p.m., find-

(i) the brake mean effective pressure;
(ii) the brake thermal efficiency;
(iii) the air standard efficiency ($\gamma = 1.4$);
(iv) A/F ratio by weight.

Assume volumetric efficiency of 80% 1 kg of petrol vapour = 0.26 m^3 at 1.03322 kgf/cm^2 and 15^O R = 29.27 kgf/kg-K. [7]

Q.8 (a) Discuss the necessity of using a thermostat valve in the engine cooling system. Explain the construction and working of any type of thermostat valve. [7]

(b) Explain briefly full flow and partial flow lubricating system with diagram. Indicate their merits. [7]

Q.9 (a) What is biodiesel? Explain various processes involved in transesterification process to convert vegetable oil into biodiesel. [7]

(b) What are hybrid vehicles? With the help of a schematic diagram, explain the working of any hybrid electric auto-vehicle. [7]