VEHICLE BODY ENGINEERING (SEMESTER - 6)

CS/B.TECH (AUE-N)/SEM-6/AUE-602/09

1. ....
Signature of Invigilator

2. ....
Signature of the Officer-in-Charge

Reg. No.

Roll No. of the Candidate

- -

CS/B.TECH (AUE-N)/SEM-6/AUE-602/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
VEHICLE BODY ENGINEERING (SEMESTER - 6)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.

2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question.**

    b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.

3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.

4. Read the instructions given inside carefully before answering.

5. You should not forget to write the corresponding question numbers while answering.

6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.

7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**

8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.

9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

				Group – A						Group – B		Group – C		Total Marks	Examiner's Signature
Question Number															
Marks Obtained															

....

Head-Examiner/Co-Ordinator/Scrutineer

6681 (05/06)

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ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

VEHICLE BODY ENGINEERING

SEMESTER – 6

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GROUP – A

(Multiple Choice Type Questions)

1.   Choose the correct alternatives for the following :

i)   The front doors of passenger car are usually hinged at

   a)   central pillar   b)   corner pillar

   c)   roof beam   d)   floor beam.   1

ii)   From economic point of view which car do you prefer ?

   a)   Saloon car   b)   Hatch back car

   c)   Convertible car   d)   Multi-utility vehicle.   1

iii)   Piston rings are made of

   a)   brass   b)   bronze

   c)   cast iron   d)   alloy steel.   1
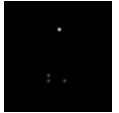
iv)   Folding split type seat is used in

   a)   mini bus   b)   long distance travelling bus

   c)   passenger car   d)   sports car.   1

v)   The drawbar pull of a vehicle with a motor torque of 115 Nm, an overall gear reduction of 10 : 1 and rolling radius of the driving tyre 400 millimetres and a GVW of 4,500 kilograms over good concrete, $C_R = 0 \cdot 15$, is

   a)   2220 N   b)   1220 N

   c)   220 N   d)   none of these.   2

vi) The percentage grade that can be negotiated by a vehicle having a hydraulic motor torque of 117 newton-metres. An overall gear reduction in high of 12 to 1, a tyre rolling radius of 400 mm and a gross vehicle weight of 4,500 kg driving over good concrete $C_R = 0.15$, is
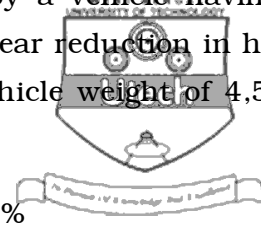
     a)   6·5 %   b)   0·65 %

     c)   0·065 %   d)   none of these.   2

vii) Aerodynamic force on vehicle depends on

     a)   road gradient   b)   frictional force between road and tyre

     c)   vehicle speed   d)   none of these.   1

viii) Wind shield is made of

     a)   thin aluminium sheet   b)   thin steel sheet

     c)   glass sheet   d)   thin copper sheet.   1

GROUP – B

(Short Answer Type Questions)

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

2. Briefly discuss the operation of air bags and their actuating mechanisms with neat sketches.

3. Explain with the help of a neat ray diagram the functioning of a PES headlamp system. Also mention its distinctive advantage/s.

4. Mention the various types of window regulator used in modern passenger car. Describe with neat sketch any one of them.

5. What are composite materials ? Why are these materials used in an automobile ? Mention the names and position of the components. Where are those materials used in automobile ?
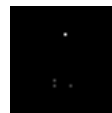
6. With respect to Figure 1, outline the mean values of L 11, L40, L53 H30 and H17 according to SAE standards for maximum ergonomic comfort of the driver.
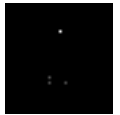
Figure - 1

GROUP – C

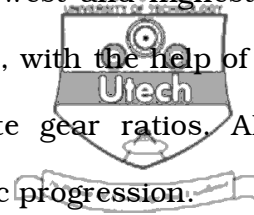**(Long Answer Type Questions)**

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

7. a) Explain the percentage torque rise available to a vehicle. Comment on the effect that the torque rise has on vehicle performance in general.   1 + 2

   b) Define ratio span. Comment on its importance in selecting gear ratios for a commercial heavy vehicle and that of a passenger car.   1 + 2

   c) Derive the relation between vehicle speed and engine seed for a gear ratio of *G* and differential gear ratio *H*. Hence derive an expression for tractive effort *T*. Assume transmission efficiency η, engine speed *N* rpm, tyre radius *R*, vehicle speed *V* km/hr. Your answer should be accompanied by a torque-speed flow diagram.   5 + 4

8. a)   What are the design criteria for choosing the lowest and highest gear ratios of typical manual automotive transmission ? Hence, with the help of the associated Figure 2, explain the necessity of intermediate gear ratios. Also show why intermediate gear ratios tend to follow a geometric progression.   7

Figure - 2

b)   With respect to Figure 3, comment on the vehicle performance at each of the scenarios outlined below. Substantiate your argument with neat sketches showing the action which needs to be taken clearly on the sketch.

i)   Vehicle travelling at speed OX in the third gear ratio encounters a resistance depicted by curve D.

ii) Vehicle travelling at speed OM in the third gear ratio encounters a resistance depicted by curve B.

iii)   Acceleration characteristics of the vehicle with speed *OX* in the third gear ratio with respect to the resistance curves *A, B, C, D*.

Figure - 3   8

9.   Explain the use of wind shield in automobile's body. Mention the particular properties to be introduced on it providing reason(s) for the purpose. Discuss the manufacturing technique for such component.   15

10.   You are to design the front door of a high speed passenger car. Draw the free body diagram of such door assembly. Explain how door stiffness is improved. Discuss the reason(s) of providing hinges at the front portion of the door only. Mention the principal attachments used in the door assemblies.   15
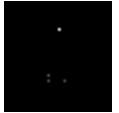
11. The co-efficient of rolling resistance for a truck weighing 62293·5 N is 0·018 and the co-efficient of air resistance is 0·0276. The top gear ratio is 6·2 : 1 and its corresponding transmission efficiency is 0·9 while the second gear ratio is 15 : 1 and its transmission efficiency is 0·8. The frontal area is 5·574 sq m. If the truck is to obtain a speed of 88 km/hr in top gear, calculate :

a)   the engine brake power

b)   the engine speed

c)   the maximum grade the truck can negotiate at the above engine speed in second gear

d)   the maximum drawbar pull at the engine speed in second gear.

Given :

$$R_{\text{TOTAL}} = C_R \times W + C_A \times A_{\text{FRONTAL}} \times V^2$$

$$R_{\text{TYRE}} = 0·8125 \text{ m}$$

(Notations have their usual meanings).   15

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END