Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Sixth Semester

AUTOMOBILE ENGINEERING

U15AUT601 : Chassis and Engine Component Design

(Use of PSG Data Book and Approved data Books are Permitted)

COURSE OUTCOMES

CO1: Design of Vehicle Frame and Suspension
CO2: Design of Front Axle and Steering Systems
CO3: Design of Real Axle
CO4: Design of Braking System
CO5: Design of Cylinder and Piston
CO6: Design of Connecting Rod
CO7: Design of Crankshaft
CO8: Design of Valves And Valve Train

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code CO6 [K_2]

IC Engine Parts	Material
A. Crankshafts	**i.** Aluminium alloy
B. Connecting rod	**ii.** Carbon steel
C. Piston	**iii.** Nickel cast iron
D. Cylinder Liner	**iv.** mild carbon steels to alloy steels

	A	B	C	D
a)	ii	i	iii	iv
b)	iv	ii	i	iii
c)	ii	iv	iii	i
d)	iii	i	ii	iv

2. Which is correct equation for steering? CO2 [K_2]

a) $\sin(\alpha+\theta)+\sin(\alpha-\varphi)=2\sin\alpha$ (b) $\sin(\alpha-\theta)+\sin(\alpha+\varphi)=2\sin\alpha$

c) $\sin(\alpha-\theta)+\sin(\alpha+\varphi)=\sin\alpha$ (d) $\sin(\alpha+\theta)+\sin(\alpha-\varphi)=\sin\alpha$

3. Consider the following statements: CO2 [K_2]

The stiffness of a Leaf spring depends on the

1. Length of spring 2.Width of leaf 3. Thickness of leaf 4. Structure of vehicle

a) 1,2 b) 1,3&4

c) 1,4 d) 1,2&3

4. The propeller shaft consist of CO3 [K_2]

a) knuckle joint (b) flange coupling

c) universal joint (d) Rag joint

5. In designing a connecting rod, it is considered like ..... for buckling about X-axis. CO6 [K_2]

a) both ends fixed b) both ends hinged

c) one end fixed and the other end hinged d) one end fixed and the other end free

6. Front axle is facilitates CO1 [K_2]

a) Steering and absorbs shocks b) Suspension

c) Drive the vehicle d) All of the above

7. Consider the following statements : The I-section of the connecting rod is CO6 [K_2]

1) Four times strong in buckling about Y-axis than about X-axis.
2) Used due to its lightness and to keep the inertia forces as low as possible specially in case of high speed engines.
3) Withstand high gas pressure.

Which of the statements given above is/are correct?

a) 1,2 and 3 b) 2,3

c) 1,2 d) 3 alone

8. The rectangular chassis frame to distort to a parallelogram shape, known as CO2 [K_2]

a) Vertical bending b) Longitudinal torsion

c) Lozenging d) Lateral bending

9. *Assertion (A):* The compression rings are usually made of Rectangular cross-section CO6 [K_2]

Reason (R): Compression rings provides complete sealing effect.

a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false d) A is false but R is true

10. A cylinder liner which does not have any direct contact with the engine cooling water is known as_____. CO6 [K_2]

a) Dry liner b) Wet Liner

c) Semi floating liner d) Partial floating liner

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11.	What are the forces and stresses the automobile frame has to withstand?	CO1	[K_2]
12.	What are the advantages of using coil spring over leaf spring?	CO2	[K_2]
13.	Write the fundamental condition to be satisfied for true rolling motion.	CO2	[K_2]
14.	Why is front axle and designed as I – section in the middle and elliptical section at the ends?	CO2	[K_2]
15.	Give the expression for calculating critical speed of propeller shaft.	CO3	[K_2]
16.	What are the Principal Parts of an IC Engine?	CO5	[K_2]
17.	What are the various forces acting on the connecting rod?	CO6	[K_2]
18.	Classify Crank Shaft. What is the function of Crank Shaft?	CO7	[K_2]
19.	Why the area of the inlet valve port is made larger than the area of exhaust valve port?	CO8	[K_2]
20.	The conical valve of an I.C. engine is 60 mm in diameter and is subjected to a maximum gas pressure of 4 N/mm^2. The safe stress in bending for the valve material is 46 MPa. The valve is made of steel for which k = 0.42. The angle at which the valve disc seat is tapered is 30°. Determine thickness of the valve head.	CO8	[K_2]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	A torsion-bar suspension is to be designed to support a maximum static load of 3433.5N at the end of a lever arm 250mm long. The deflection of the lever above the horizontal is to be 30^0 with a total angle of deflection of 90^0. Assuming a safe allowable stress of 784800KPa, Calculate (i) The diameter of the torsion bar (ii) The effective length and the load rate.	CO2	[K_3]
22.	The Load distribution between the front and rear axle of a motor vehicle weighing 1350 kgf is that 48% of the total load is taken by the front axle. The width of the track is 140cm and the distance between the centers of the spring pads is 66cm.Design a suitable I-Section for the front axle assuming that the width of the flange and its thickness are 0.6 and 0.2 of the overall depth of the section respectively and the thickness of the web 0.25 of the width of the flange. Assume a working stress of 915 kgf/cm^2	CO2	[K_3]

23. (i) An automobile engine develops 28KW at 1500rpm and its bottom gear ratio 3.06. If a propeller shaft of 40mm outside diameter is to be used, determine the inside diameter of mild steel tube to be used. Assuming a safe shear stress of 55 X 10^3KPa for the MS. (7) CO3 [K_3]

(ii) An automobile engine develops a maximum torque of 162Nm.The low gear ratio of transmission is 2.75, while the back axle ratio is 4.25. The effective wheels radius is 0.325m and the co-efficient of friction between the tyre and the road surface is 0.6. If the permissible shear stress is 32373 x 10^4Pa. Determine the maximum shaft diameter. Assuming that the load is nearly torsional. What is maximum load permissible on each wheel? (7)

24. A four stroke diesel engine has the following specifications: Brake power = 5 kW; Speed = 1200 r.p.m. ; Indicated mean effective pressure = 0.35 N / mm^2 ; Mechanical efficiency = 80 %. Determine: 1. bore and length of the cylinder; 2. thickness of the cylinder head; and 3. size of studs for the cylinder head. CO5 [K_4]

25. Design a cast iron piston for a single acting four stroke engine for the following data: Cylinder bore = 100 mm ; Stroke = 125 mm ; Maximum gas pressure = 5 N/mm^2 ; Indicated mean effective pressure = 0.75 N/mm^2 ; Mechanical efficiency = 80% ; Fuel consumption = 0.15 kg per brake power per hour ; Higher calorific value of fuel = 42 × 10^3 kJ/kg ; Speed = 2000 r.p.m. Any other data required for the design may be assumed. CO5 [K_4]

26. Design a connecting rod for an I.C. engine running at 1800 r.p.m. and developing a maximum pressure of 3.15 N/mm^2. The diameter of the piston is 100 mm; mass of the reciprocating parts per cylinder 2.25 kg; length of connecting rod 380 mm; stroke of piston 190 mm and compression ratio 6 : 1. Take a factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressures as 10 N/mm^2 and 15 N/mm^2. The density of material of the rod may be taken as 8000 kg/m^3 and the allowable stress in the bolts as 60 N/mm^2 and in cap as 80 N/mm^2. The rod is to be of I-section for which you can choose your own proportions. Any other data required for the design may be assumed. CO6 [K_6]

27. Design a Overhung Crank Shaft. CO7 [K_7]

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OFFENDING COMMAND: --nostringval--

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