Register Number:……..

KUMARAGURU
college of technology
character is life

B.E DEGREE EXAMINATIONS:MAY 2017

(Regulation 2014)

SixthSemester

AUTOMOBILE ENGINEERING

U14AUT602**:** Engine Design

COURSE OUTCOMES

CO1: Understand the design assumptions.

CO2: Design of various Automotive Engine components

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match the following: CO2 [K_2]

Thread Types	Thread Angle
A.connecting rod	i.Full Floating
B.compression rings	ii.Rectangular cross-section
C.Piston Head	iii.I – Section
D.Piston Pin	iv.withstand gas pressure

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

2. Piston rings are usually made up of _____. CO2 [K_2]

a) Alloy steel b) Platinum & palladium

c) Grey cast iron d) Aluminum

3. The portion of the piston below the ring section is known as CO2 [K_2]

a) Piston skirt b) Piston crown

c) Piston groove d) Piston Head

4. The rocker arm is pivoted at its center by CO2 [K_2]

a) Piston pin
b) Crank pin
c) Fulcrum pin
d) Gudgeon pin

5. Forces acting on the rocker arm CO2 [K_2]

i) Gas load
ii) Spring load
iii) Twisting Moment
iv) Valve acceleration

a) ii, iv, i
b) ii, iii, i
c) i, iii, iv
d) All the above

6. Assertion: The thickness of the webs of crank shaft is assumed to be from $0.4d_s$ to $0.6d_s$ CO2 [K_2]
Reason: Crank webs should be in identical dimension.

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

7. Which are these following statements are correct, CO2 [K_2]
A)A crankshaft with only one side crank or center crank is called a Single throw crankshaft
B)The FOS of crank shaft is taken from 3 to 4.
C) The thickness of the cheeks or webs of crankshaft is assumed to be from0.4 ds to 0.6 ds

a) A, B, and C
b) A and B
c) A and C
d) B and C

8. The most suitable section for the connecting rod is _____ CO2 [K_2]

a) H – Section
b) O – Section
c) I – Section
d) V - Section

9. The connecting rods are usually manufactured by CO2 [K_2]

a) Powder metallurgy
b) Squeeze Casting
c) Drop forging process
d) Spray forming

10. In case of a multiple disc clutch, if n_1 are the number of discs on the driving shaft and n_2 are the number of the discs on the driven shaft, then the number of pairs of contact surfaces will be CO2 [K_2]

a) $n_1 + n_2$
b) $n_1 + n_2 - 1$
c) $n_1 + n_2 + 1$
d) $n_1 + n_2 + 9$

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11.	Why is piston pin located at or above the middle of the skirt length?	CO2	[K_3]
12.	Why is piston made lightweight?	CO2	[K_3]
13.	What are the forces acting on the connecting rod?	CO2	[K_2]
14.	What is the function of the connecting rod?	CO2	[K_2]
15.	What is the difference between center and overhung crankshafts?	CO2	[K_3]
16.	Name the materials for crankshafts?	CO2	[K_2]
17.	What are the drawbacks for centrifugal clutch?	CO2	[K_3]
18.	What are the advantages of single plate clutch over multi-plate clutch?	CO2	[K_2]
19.	What is the purpose of valve spring?	CO2	[K_2]
20.	Why is the area of inlet valve port more than that of an exhaust valve?	CO2	[K_3]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Explain in detail about the design procedure for engine cylinder.	CO2	[K_2]
22.	The following data is given for the piston of a four – stroke diesel engine:	CO2	[K_3]

Cylinder bore = 250 mm

Material of Piston rings = Grey cast iron

Allowable tensile stress = 100 N/mm^2

Allowable radial pressure on cylinder wall = 0.03 MPa

Thickness of piston head = 42 mm

Number of piston rings = 4

Calculate:

i) Radial width of piston rings;

ii) Axial thickness of the piston ring;

iii) Gap between the free ends of the piston ring before assembly;

iv) Gap between the free ends of the piston ring after assembly;

v) Width of the top land;

vi) Width of the ring grooves;

vii) Thickness of the piston barrel &Thickness of the barrel at open end.

23. Determine the dimensions of the cross section of the connecting rod for a diesel engine with the following data: CO2 [K_3]

Cylinder bore = 100mm
Length of the connecting rod = 350 mm
Maximum gas pressure = 4 MPa
FOS = 6

24. Design a valve spring for the exhaust valve of a four stroke engine using the following data: CO2 [K_3]

Diameter of the valve head = 75 mm
Lift of valve = 25mm
Maximum suction pressure = 0.02 MPa below atmosphere pressure
Stiffness of spring = 10 N/mm
Spring index = 8
Permissible torsional shear stress for spring wire = 300 N/mm^2
Modulus of rigidity = 84 X $10^3 N/mm^2$
Total gap between consecutive coils, when the spring is subjected to maximum force, can be taken as 15% of the maximum compression.

25. Explain in detail about center crank shaft & its various design assumptions with a neat sketch. CO2 [K_2]

26. Design a center crank shaft based on maximum bending moment for a single – cylinder vertical engine using the following data: CO2 [K_3]
Cylinder bore = 125mm
(L/r) ratio = 4.5
Maximum gas pressure = 2.5 MPa
Length of stroke = 150 mm
Weight of flywheel cum belt pulley = 1kN
Total belt pull = 2N
Width of the hub of the flywheel cum belt pulley = 200 mm
Assume the suitable data & state the assumptions you make.

27. An automotive plate clutch consists of two pairs of contacting surfaces with asbestos friction lining. The maximum engine torque is 250 N-m. The coefficient of friction is 0.35 The inner and outer diameters of friction lining are 175 & 250 mm respectively. The clamping force is provided by nine springs, each compressed by 5mm to give a force of 800 N, when the clutch is new. CO2 [K_3]
   i) What is the factor of safety with respect to slippage when the clutch is brand new?
   ii) What is the factor of safety with respect to slippage after initial wear has occurred?
   iii) How much wear of friction lining can take place before the clutch will skip?

****