

University of Mumbai
Examinations Summer 2022

Time: 2hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Which intelligent agent works on partial observable environment?
Option A:	Model based agent
Option B:	Simple reflex agent
Option C:	Learning agent
Option D:	Goal based agent
2.	_____ is not the type of automation.
Option A:	Fixed Automation
Option B:	Programmable Automation
Option C:	Flexible Automation
Option D:	Independent Automation
3.	Which of the following statements are true for accumulators used in hydraulic systems? 1.accumulator stores fluid with pressure 2.accumulator stores fluid without any pressure 3.accumulator stores compressible liquid 4. spring is used as an external source to keep the fluid under hydraulic pressure
Option A:	1, 3 and 4
Option B:	2 and 3
Option C:	1 and 4
Option D:	2, 3 and 4
4.	_____ is not the part of Hydraulic System.
Option A:	Compressor
Option B:	Pump
Option C:	Motor
Option D:	Oil Sump
5.	The number of moveable joints in the base, the arm, and the end effectors of the robot determines_____.
Option A:	Flexibility
Option B:	payload capacity
Option C:	operational limits
Option D:	degrees of freedom
6.	The function of PLC is to_____.
Option A:	Control outputs based on logical decisions
Option B:	Control motor speed
Option C:	Control voltage change form high voltage to low voltage
Option D:	Amplify weak signals
7.	Initial & final position of piston rod is identified by_____
Option A:	Push button

Option B:	DCV
Option C:	Hose pipes
Option D:	Limit Switch
8.	Which type of Machine learning use only labeled data for learning.
Option A:	Semi Supervised
Option B:	Unsupervised
Option C:	Reinforcement
Option D:	Supervised
9.	What is the DC range of solenoids in pneumatic systems?
Option A:	12 V and 24 V
Option B:	110 V and 220 V
Option C:	6V and 9V
Option D:	0 to 5 V
10.	Electric drive is preferred over Pneumatic and Hydraulic because of ____.
Option A:	Less expensive
Option B:	Self-lubrication and cooling
Option C:	Positioning accuracy
Option D:	High strength

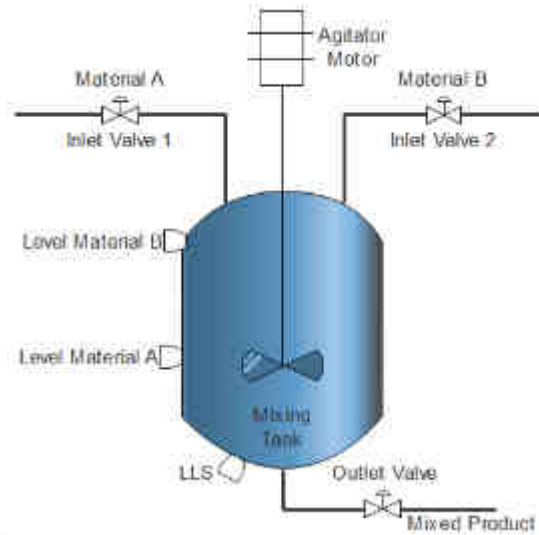
Subjective/Descriptive Questions

Q2	Solve any Four out of Six 5 marks each
A	Explain Linear regression in detail with applications.
B	Draw and explain meter in and meter out circuit along with its significance in detail
C	Explain depth first search algorithm in short.
D	Write short note on FRL Unit
E	Draw and describe architecture of Goal Based agent.
F	Write short note on End effectors used in robots

Q3	Solve any Two Questions out of Three 10 marks each
A	Design electro pneumatic circuit for two cylinder operation with following sequence using 5/2 both side solenoid operated valve as DCV. (AB)+ Delay A- B- (Where B- is 50% Slow) With user selection option single cycle & Multicycle operation.
B	Write detail note on Robot Configurations with respect to joints, applications, advantages and disadvantages. (any three)
C	Explain Supervised, Unsupervised and Reinforcement Learning with applications and examples in detail.

Q4.	Solve any Two 5 marks each
A	Solve any Two 5 marks each
i.	State & explain K Means Clustering algorithm in detail.
ii.	Explain various levels of Automation.
iii.	Discuss concept of Natural language processing.
B	Solve any One 10 marks each
i.	Draw PLC Ladder logic for following operation

Material A and Material B are collected in a tank. These materials are mixed for a 5min. Mixed product is then drained out through Outlet valve. Level sensors are used to detect levels. Motor is used for mixing operation. Solenoid vales are used to control inlet and outlet operations.



ii.

Two double acting pneumatic cylinders A & B are selected for industrial application. Design PLC system to achieve the given output as per the following sequence specified (A+B+) (A-B-)

University of Mumbai
Examinations Summer 2022
 Program: Automobile
 Curriculum Scheme: Rev2019
 Examination: TE Semester VI
 Course Name: Automotive Systems Design

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Tyres in which plies are wound in parallel to each other are called as
Option A:	Parallel Ply Tyre
Option B:	Radial ply Tyre
Option C:	Cross Ply Tyre
Option D:	Tubeless Tyre
2.	The vertical tilt of tyre when looking from front is called as
Option A:	Camber
Option B:	Castor
Option C:	Kin Pin Inclination
Option D:	Toe In
3.	The maximum Gear Reduction at final drive for cars is
Option A:	10:1
Option B:	8:1
Option C:	4:1
Option D:	7:1
4.	Steering Gear Ratio for Heavy Vehicles is
Option A:	10:1
Option B:	36:1
Option C:	15:1
Option D:	50:1
5.	Wind up phenomenon occurs in
Option A:	Coil Spring
Option B:	Air spring
Option C:	Shock Absorber
Option D:	Leaf Spring
6.	The Hotchkiss drive is used to eliminate
Option A:	driving force
Option B:	Torque reaction
Option C:	Braking force
Option D:	Side force
7.	The components of Automatic transmission are
Option A:	Epicyclic Gear train, Fluid Flywheel
Option B:	Epicyclic Gear train, Torque Converter
Option C:	Epicyclic Gear train, Fluid Flywheel, Torque Converter
Option D:	Helical Gears, Fluid Flywheel, Torque Converter
8.	To achieve perfect steering condition the mechanism used is

Option A:	Davis Gear
Option B:	Pentograph
Option C:	Ackerman
Option D:	Four Bar mechanism
9.	SLA type suspension is also called as
Option A:	Single Wishbone
Option B:	Double wishbone
Option C:	Mac Pherson strut
Option D:	Independent
10.	Aspect Ratio for tyres is
Option A:	Section Height to width
Option B:	Section width to height
Option C:	Section Height to Vertical load
Option D:	Section width to Vertical load

Q2. (20 Marks Each)	
A	Solve any Two 5 marks each
i.	Explain Single Plate clutch with Diagram
ii.	Differentiate Between Radial Ply Tyre and Cross Ply tyre.
iii.	Enlist Steering Geometry Angles and sketch diagrams for them.
B	Solve any One 10 marks each
i.	Explain working of Constant mesh Gear Box with Advantages and disadvantages. Also explain Double de Clutching
ii.	Explain Front Engine front wheel drive with its advantages and disadvantages

Q3. (20 Marks Each)	
A	Solve any Two 5 marks each
i.	Explain Design Considerations for Piston
ii.	Explain working of Tandem Master cylinder with Sketch.
iii.	Draw neat sketch of Telescopic type shock absorber and explain working of it.
B	Solve any One 10 marks each
i.	A gear box with three speeds forward and one reverse is to provide the speed reduction as follows- highest 5.1:1, Intermediate 8.8:1 and low 16:1 with reverse 19.8:1 with reduction 5.5:1 at Rear Axle. Assuming the smallest pinion has 15 no of teeth and speed of the lay shaft half of the engine shaft, find the no of teeth for all gears.
ii.	The bore of cylinder of the four-stroke diesel engine is 120 mm. The maximum gas pressure inside the cylinder is limited to 4 Mpa. The cylinder head is made of cast iron and allowable tensile stress is 40 N/mm ² . . Determine the thickness of cylinder head. The studs which are made of steel, have allowable stress as 50 N/mm ² . Calculate (i) Number of studs, (ii) nominal diameter of studs and (iii) pitch of studs. Draw the neat diagram for each component.

Q4. (20 Marks Each)	
A	Solve any Two 5 marks each
i.	Write classification of Suspension System with Functions of suspension system
ii.	Explain construction and working of Differential
iii.	Enlist advantages and disadvantages of Leaf Spring
B	Solve any One 10 marks each
i.	Design a propeller shaft for an engine developing 40 HP at 1500 rpm. The bottom gear ratio is 3.2 and ratio of external and internal diameter is 1.8. The safe shear for the material is 560 Kg/cm ² .
ii.	A disc clutch consists of 5 discs. The outer diameter of the contact surface is to be 27.9 cm and the inside is 17.8 cm. Determine the pressure with which discs must be held together. The coefficient of friction is 0.3. The clutch is transmitting 30 HP at 700 rpm.

University of Mumbai

Examinations Summer 2022

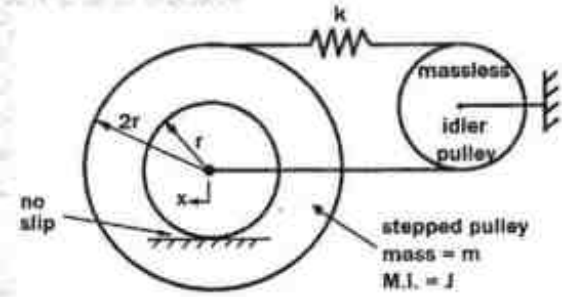
Course Code: AEC602 and Course Name: Mechanical Vibrations

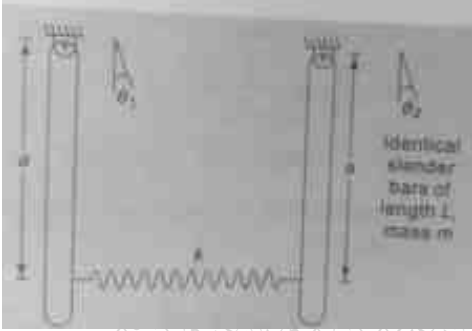
Time: 2 hour 30 minutes

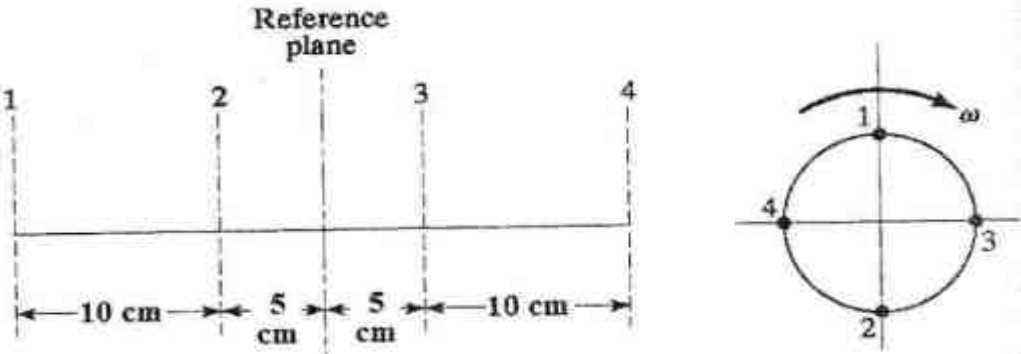
Max. Marks: 80

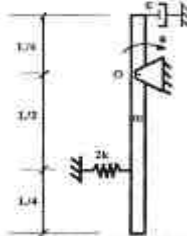
Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	When the energy of vibrating system is gradually dissipated by friction and other resistances, the vibration is said to be _____
Option A:	Free vibration
Option B:	Damped vibration
Option C:	Forced vibration
Option D:	Multi degree vibration
2.	In under damped vibrating system, the amplitude of vibration _____.
Option A:	Decreases linearly with time
Option B:	Increases linearly with time
Option C:	Decreases exponentially with time
Option D:	Increases exponentially with time
3.	What is meant by node point?
Option A:	The point at which amplitude of vibration is maximum
Option B:	The point at which amplitude of vibration is minimum
Option C:	The point at which amplitude of vibration is zero
Option D:	The point at which amplitude of vibration is non zero
4.	The ratio of the force transmitted to the applied force is known as...
Option A:	Damping factor.
Option B:	Transmissibility
Option C:	Damping coefficient.
Option D:	Logarithmic decrement.
5.	Solution of forced damped single degree freedom system differential equation consist of
Option A:	Only transient vibration
Option B:	Only steady state vibration
Option C:	Transient and and Steady state vibration
Option D:	Longitudinal Vibration
6.	Raleigh's method is used for estimation of fundamental natural frequency for ----.
Option A:	Transverse vibration
Option B:	Torsional vibration
Option C:	Longitudinal vibration
Option D:	Nonlinear vibration
7.	In order to facilitate the starting of locomotive in any position, the cranks of a locomotive, with two cylinders, are placed at _____ to each other.
Option A:	45°
Option B:	90°
Option C:	120°
Option D:	180°
8.	In a revolving rotor, the centrifugal force remains balanced as long as the centre of the

	mass of the rotor lies _____.
Option A:	above the axis of shaft.
Option B:	on the axis of the shaft.
Option C:	below the axis of shaft.
Option D:	away from the axis of shaft.
9.	Transmissibility versus frequency ratio graph will have following regions
Option A:	Spring and Mass controlled region
Option B:	Mass and Damping controlled region
Option C:	Damping and Spring controlled region
Option D:	Spring, Damping and Mass controlled regions
10.	The frequency range of a vibrometer is generally _____.
Option A:	1000 Hz to 5000 Hz
Option B:	6 Hz to 10 Hz
Option C:	1 Hz to 5 Hz
Option D:	100 Hz to 500 Hz

Q2 (20 Marks)	Solve any Two Questions out of Three	10 marks each
A	<p>Considering generalized coordinates x, Evaluate the time period of vibration for the system show below</p> 	
B	<p>40 N at 20 cm, 30 N at 40 cm, and 20 N at 60 cm from the fixed end are the loading on a cantilever. The deflection under 20 N due to the entire load is 5 mm. find natural frequency of the system. What would be the new frequency if 20 N is added at 20 cm from the fixed end? Also compare the new frequency obtained using Dunkerley's method</p> <p>NOTE : the deflection at section i due to unit load at section J is given by -</p> $U_{ij} = \frac{S_i^2 (3S_j - S_i)}{\text{Constant}} \text{ for } S_i < S_j, U_{ij} = U_{ji}$	
C	<p>Explain Dunkerley's method and Raleigh's method to calculate the frequency of the transverse vibration of shaft carrying number of point loads.</p>	
Q3 (20 Marks)	Solve any Two Questions out of Three	10 marks each

A	<p>Use Lagrange's equation to derive the differential equations governing the motion of the system of figure shown using θ_1, θ_2 as the generalized coordinates.</p> 
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B	<p>A four-cylinder in-line engine has a reciprocating mass of 1.6 kg, a stroke of 15 cm, and a connecting rod length of 25 cm in each cylinder. The cranks are separated by 10 cm axially and 90° radially, as shown in the following figure. Find the unbalanced primary and secondary forces and couples with respect to the reference plane shown in figure, at an engine speed of 1500 r.p.m</p> 
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C	<p>Figure below shows a pendulum connected to a spring and viscous damper. Derive the equivalent system parameters for small angular oscillations θ</p> 
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Q4 (20 Marks)	Solve any Four out of Six	5 marks each
A	A vibrating system consists of a mass 1 kg a spring of stiffness 1 N/mm and a damper of damping coefficient 0.05 N Sec/mm. Determine	i)
B	Explain Vibration parameters with neat sketch.	
C	Explain the terms: Logarithmic decrement, Magnification Factor	
D	Write short note on balancing of reciprocating engine.	
E	What are the goals of vibration engineer? Name any three causes of vibration.	
F	Explain Motion Transmissibility with neat diagrams, related formulae and graphs.	

University of Mumbai
Examination summer 2022
Program: Mechanical Engineering
Curriculum Scheme: R 2019

Examination: TE

Course Code: AEDLO6021

and

Course Name: Press Tool Design

Semester: VI

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	In blanking operation the shear is provided on following element
Option A:	On Punch
Option B:	Punch holder
Option C:	On die
Option D:	Stripper plate
2.	The value of the scrap bridge for 2mm material thickness is following
Option A:	0.8mm
Option B:	2mm
Option C:	3.2mm
Option D:	5mm
3.	Spring back in sheet metal bending depends on the
Option A:	Elastic limit
Option B:	Bend radius
Option C:	Degree of bend
Option D:	Thickness of sheet
4.	Wrinkling is a common defect found in
Option A:	Bent components
Option B:	Deep drawn components
Option C:	Embossed components
Option D:	Blanked component
5.	The distance from the top of the bed to the bottom of the slide with stroke down and adjustment up is called as.....
Option A:	Shut height
Option B:	Top height
Option C:	Bottom height
Option D:	Height
6.	Which of the following parameter correctly describes the size of press
Option A:	Maximum force its ram can exert
Option B:	Stroke length
Option C:	Ram speed
Option D:	Die space
7.	In which of the following die, more than one cutting operation is performed at one station of the press in one stroke of the ram

Option A:	Compound die
Option B:	Embossing die
Option C:	Progressive die
Option D:	Combination die
8.	Material utilization is ratio of
Option A:	Area of blanks from strip to area of the strip before blanking
Option B:	Area of blanks from strip to area of the strip after blanking
Option C:	Diameter of blanks from strip to area of the strip before blanking
Option D:	Diameter of blanks from strip to area of the strip after blanking
9.	In sheet metal blanking, shear is provided on punches and dies so that
Option A:	Press load is reduced
Option B:	Good cut edge is obtained
Option C:	Warping of sheet is minimized
Option D:	Cut blanks are straight
10.	The shear strength of a sheet metal is 300 MPa. The blanking force required to produce a blank of 100 mm diameter from a 1.5 mm thick sheet is close to
Option A:	45KN
Option B:	70KN
Option C:	141KN
Option D:	3500KN

Q2	Solve any Four out of Six	5 marks each
A	Write benefits, limitations and applications of press tools.	
B	With Suitable example explain calculations for Economic Strip Layout.	
C	Write Significance of Optimum Clearance.	
D	Explain basic construction & working of Shaving dies.	
E	Explain the condition of energy overloading of press.	
F	Differentiate between hydraulic press and mechanical press.	

Q3	Solve any Two Questions out of Three	10 marks each
A	What is Bending? Explain types of Bending Operation.	
B	Explain with the help of neat sketch working of Combination Die.	
C	A deep drawing operation is used to make a cup of diameter 50mm, height of 50mm & corner radius of 1.4mm from medium Carbon Steel material of 0.8mm thick. Design die for the same. Yield strength is 427N/mm ² , C=0.65.	

Q4	Solve any Two Questions out of Three	10 marks each
A	Explain the phenomenon of spring back and the reasons that develop it. Also discuss the factors on which spring back depends upon.	
B	What is stripping force and on what factors does it depends upon? Also compare between fixed and spring loaded stripper.	
C	A press is designed to offer 90 ton of force at 20° crank angle with a stroke of 15cm. Stroke is variable from 1cm to 15cm. Calculate tonnage available when ram is 3cm above its BDC. Take stroke length equal to 10cm.	

University of Mumbai
Examination First Half 2022

Examinations Commencing from May/June 2022

Program: **TE Mechanical**

Curriculum Scheme: Rev 2019

Examination: BE Semester VI

Course Code: MEDLO6022 and Course Name: Tool Engineering

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Cutting conditions like large chip thickness, low cutting speed and small rake angle are favorable for producing following types of chips.
Option A:	Continuous chips
Option B:	Discontinuous chips
Option C:	Continuous chips with built up edge
Option D:	Segmental chips
2.	It is the angle between the portion of the side flank below side cutting edge and line perpendicular to base of the tool and measured at right angle to side flank is called as
Option A:	End relief angle
Option B:	Back rake angle
Option C:	Side relief angle
Option D:	Side rake angle
3.	In a single point cutting tool used for turning, the geometry as per ORS are : Inclination angle = 4° ; Orthogonal rake angle = 12° and Approach angle 75° . What will be the value of side rake angle in ASA of tool nomenclature.
Option A:	10.60°
Option B:	21.51°
Option C:	12.59°
Option D:	14.32°
4.	Face milling includes axis of cutter ----- to work surface
Option A:	Normal
Option B:	Parallel
Option C:	Inclined
Option D:	Oblique
5.	Flank wear occurs mainly on which of the following
Option A:	Nose part and top face

Option B:	Cutting edge only
Option C:	Face of carrying tool at a short distance from the cutting edge
Option D:	Nose part, front relief face, and side relief face of cutting tool
6.	Which one of the following is the hardest cutting tool material next only to diamond ?
Option A:	Cemented carbides
Option B:	Ceramics
Option C:	Silicon
Option D:	Cubic boron nitride
7.	What is the variation of cutting speed with tool life on Log-Log scale?
Option A:	Parabolic variation
Option B:	Straight line variation
Option C:	Hyperbolic variation
Option D:	Elliptical variation
8.	Cutting fluids should possess ----- flash point
Option A:	Low
Option B:	Medium
Option C:	High
Option D:	Low to medium
9.	In a single point cutting tool used for turning, geometry as per ASA is: Back rake = 8° , Side rake = 4° , Side Cutting edge angle = 15° . Find the value of inclination angle in ORS of tool nomenclature.
Option A:	5.7 degree
Option B:	6.5 degree
Option C:	7.5 degree
Option D:	6.7 degree
10.	With an increase in cutting speed, tool life -----
Option A:	Increases
Option B:	Decreases
Option C:	Remains same
Option D:	May increase or decrease

Q2	Solve any Four out of Six	5 marks each
A	State the requirement of tool dynamometer and explain any one mechanical dynamometer.	
B	Write the function of cutting fluid and also explain Cryogenic cooling.	

C	Write short note on primary and secondary cutting edge finish.
D	Explain the regions of heat generation in metal cutting.
E	What are the functions of a chip breakers in metal cutting operation?
F	Draw a twist drill and explain all the angles of it.

Q3.	Solve any Two Questions out of Three	10 marks each
A	Prove that the relationship $2\theta + \beta - \alpha = \frac{\pi}{2}$ holds good in orthogonal cutting, where θ = Shear angle, α = Rake angle, β = Friction angle. Also state your assumptions.	
B	For a metal machining following information is available: Tool changing time = 8 min, Tool regrinding time = 5 min, M/c running cost = Rs 30 / hr, Tool depreciation / regrind = Rs 1.2, Tool life equation $VT^{0.25} = 150$. Calculate optimum cutting speed and tool life for minimum cost of production.	
C	Explain the various steps involved in the design of circular broach and draw the neat diagram.	

Q4. A	Solve any Two	5 marks each
i.	How is the tool shank of a single point cutting tool designed ?	
ii.	Explain the design procedure for the milling cutter.	
iii.	Write the properties of cutting tool material and also explain Polycrystalline diamond (PCD).	
B	Solve any One	10 marks each
i.	During machining of C - 25 steel with 0 - 10 - 6 - 6 - 75 - 90 - 1 mm (ORS) shaped tripple carbide cutting tool. The following observation have been made. Depth of cut = 2 mm Feed = 0.2 mm/rev Speed = 200 m/min Tangential cutting force = 1600 N Feed Thrust force = 850 N Chip thickness = 0.39 mm Calculate: i) Shear angle ii) Normal force at shear plane iii) Friction force iv) Kinetic coefficient of friction v) Specific cutting energy vi) Friction angle vii) Cutting power viii) Shear strain.	
ii.	Derive an expression for optimum cutting speed and tool life for maximum production rate. Also write the assumptions associated to it.	

University of Mumbai

Program: T.E. Automobile

Curriculum Scheme: Rev2019

Examination: TE Semester VI

Course Code: AEC603 and Course Name: Vehicle Body Engineering and Safety

Time: 2 Hours 30 Minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	A monocoque chassis is one in which.....
Option A:	Chassis and body is an integrated structure
Option B:	Chassis and body are two separate parts
Option C:	Chassis is made of tubes
Option D:	Chassis is ladder frame with separate body
2.	Which of the following is NOT a factors affecting driver visibility?
Option A:	Driver Location
Option B:	Position of driver
Option C:	Suspension
Option D:	Wind screen structure inclination
3.	Which of the following vehicle component DOES NOT contribute to interference drag?
Option A:	Headrest
Option B:	Rain gutters
Option C:	Door handle
Option D:	Side mirror
4.	An open structure has which of the following condition:
Option A:	All sides of structure are present
Option B:	Side and bottom of structure is missing
Option C:	Top side of structure is missing
Option D:	Bottom of structure is missing
5.	What is Lateral Loading
Option A:	Generated due to breaking at high speed
Option B:	Generated due to bump
Option C:	Generated due to Sudden drop in path
Option D:	Generated due to cornering
6.	The aerodynamic resistance is proportional to
Option A:	Square of vehicle speed
Option B:	Cube of vehicle speed
Option C:	Square root of vehicle speed
Option D:	Cube root of vehicle speed

7.	_____ is the science of obtaining systematic measurements of the human body.
Option A:	Biometry
Option B:	Anthropometry
Option C:	Chronometry
Option D:	Algometry
8.	Autonomous emergency braking (AEB) is a Safety device.
Option A:	Driver
Option B:	Pedestrian
Option C:	Passenger
Option D:	Child
9.	Seat belt is a safety feature.
Option A:	Active
Option B:	Side
Option C:	Rear
Option D:	Passive
10.	Which of these is associated with pedestrian safety
Option A:	Air bag
Option B:	Transmission
Option C:	Steering
Option D:	Front end geometry of the vehicle

Q2. (20 Marks)	Solve any Two Questions out of Three	10 marks each
A	Explain layout of design and preliminary design for passenger cars.	
B	With neat sketches explain the following layout: Normal control, Forward control and Semi Forward Control.	
C	Explain active and Passive safety with one example each	

Q3. (20 Marks)	Solve any Two Questions out of Three	10 marks each
A	Explain with a diagram various aerodynamic forces and moments acting on a car.	
B	Explain the design consideration for vehicle body design for safety.	
C	What are different loads on vehicle body and explain it neat diagram.	

Q4. (20 Marks)	Solve any four Questions out of six	5 marks each
A	Explain fail safe and fault tolerant with example.	
B	Explain the different types of child seats.	
C	Write short note on Ultra light Steel Auto body(ULSAB)	
D	State the different cross sections used in frame construction.	
E	Write overview on vehicle scrapping policy in India	
F	Explain any technique used for body repairs.	