University of Mumbai

Examination 2020 under cluster 9 (Lead College: FAMT)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Automobile Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: AEC501 and Course Name: Internal Combustion Engine

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	If the air supplied for combustion process is less than theoretical air then the mixture is known as _____ mixture.
Option A:	lean
Option B:	stoichiometric
Option C:	rich
Option D:	Chemically corrected
2.	Speed of a Cam shaft of 4-stroke engine is _____ r.p.m. if crankshaft speed is 1000 r.p.m.
Option A:	1000
Option B:	2000
Option C:	500
Option D:	100
3.	Dissociation is defined as the disintegration of _____ at high temperatures.
Option A:	Air
Option B:	fuel
Option C:	Air-fuel mixture
Option D:	Burnt gases
4.	Fuel injection system is _____ efficient than carburetor.
Option A:	More
Option B:	Less
Option C:	Equal
Option D:	Can't compare
5.	Acceleration pump is required in carburetor to fulfill the _____ range.
Option A:	idling
Option B:	cruising
Option C:	power
Option D:	cold start
6.	Fuel is injected in intake manifold in case of _____ injection system in SI engine.
Option A:	Timed

Option B:	Continuous
Option C:	direct
Option D:	Pulsating
7.	Auxiliary port is required in carburetor in case of _____ engine.
Option A:	marine
Option B:	aircraft
Option C:	railway
Option D:	sports car
8.	_____ Combustion chamber is not used in SI engine.
Option A:	T-head type
Option B:	L-head type
Option C:	Toroidal
Option D:	F-head type
9.	Ignition quality of petrol is expressed by _____.
Option A:	Cetane number
Option B:	Octane number
Option C:	Self-ignition temperature
Option D:	Calorific value
10.	_____ system is not required in CI engine.
Option A:	Ignition
Option B:	Injection
Option C:	Lubrication
Option D:	Cooling
11.	A six cylinder 4-stroke CI engine consumes 25 kg/h fuel having specific gravity 0.85 at 3000 r.p.m. The volume of fuel injected per cycle is _____ c.c.
Option A:	0.054
Option B:	0.250
Option C:	0.027
Option D:	0.032
12.	Combustion in compression ignition engine is _____.
Option A:	Homogeneous
Option B:	Heterogeneous
Option C:	Laminar
Option D:	Turbulent
13.	Major and minor energy cells in an Air cell combustion chamber are separated by _____.
Option A:	narrow orifice
Option B:	partition
Option C:	curtain
Option D:	venturi
14.	_____ Sump lubrication system is preferable for more stability of a vehicle.
Option A:	Mist
Option B:	Dry

Option C:	Wet
Option D:	Cross
15.	Purpose of supercharging in I.C. engine is to increase _____.
Option A:	Speed of an engine
Option B:	Density of inlet air
Option C:	stability of an engine
Option D:	Load on engine
16.	Lubricant starts freezing below _____ point.
Option A:	Pour
Option B:	Fire
Option C:	Flash
Option D:	boiling
17.	Turbocharger in an I.C. engine increase_____.
Option A:	Speed of an engine
Option B:	Power output
Option C:	Mechanical efficiency
Option D:	Load on the engine
18.	Friction power of an engine is _____, if engine consumes 1 kg/hr and 1.5 kg/hr fuel to produce 1 kW and 2 kW power respectively.
Option A:	2 kW
Option B:	2.5 kW
Option C:	1 kW
Option D:	0.5 kW
19.	Throttle position sensor is located in _____ of an engine.
Option A:	Intake manifold
Option B:	Exhaust manifold
Option C:	Ignition system
Option D:	Injection system
20.	Hydrogen as an alternative fuel is not popular in I.C. engine because it is _____.
Option A:	Highly flammable
Option B:	Low calorific value
Option C:	Harmful for the environment
Option D:	Not available easily

Q2.	**Solve any Four out of Six** **5 marks each**
A	Illustrate construction and working of electronic ignition system with the help of neat sketch.
B	Describe construction and working of pump assisted thermosyphon cooling system with the help of Sketch.
C	State the advantages and disadvantages of CNG and Bio diesel.

D	Enumerate various types of losses in Fuel-air cycle
E	Illustrate combustion phenomenon in SI engine with the help of P-Θ diagram.
F	Differentiate SI engine and CI engine.

Q3.	**Solve any Two Questions out of Three** **10 marks each**
A	Calculate the diameter of the fuel orifice of a four stroke engine which develops 20 kW per cylinder at 2000 rpm. The specific fuel consumption is 0.25 kg/kWh. The fuel is injected at a pressure of 180 bar over a crank travel of 25^0. The pressure in a combustion chamber is 38 bar. Coefficient of velocity is 0.85 and specific gravity is 0.8762.
B	During the test of 40 minutes on a single cylinder gas engine of 200mm cylinder bore and 400mm stroke, working on the four stroke cycle and governed by hit and miss method of governing, the following readings were taken: Total number of revolutions = 9400 Total number of explosions = 4200 Brake load = 540 N Brake wheel diameter = 1.6 m Brake rope diameter = 2 cm Area of indicator diagram = 550 mm^2 Length of indicator diagram = 72 mm Spring number = 0.8 bar/mm Gas used = 8.5 m^3 Calorific value of gas = 15900 KJ/m^3 Determine: (i) indicated mean effective pressure (ii) indicated power, (iii) brake power, (iv) indicated thermal efficiency, (v) brake thermal efficiency.
C	In a test of an oil engine under full load condition the following results were obtained. IP = 33 kW brake power = 27 kW Fuel used = 8 kg/hour Rate of flow of water through gas calorimetre = 12 kg/min Cooling water flow rate = 7 kg/min Calorific value of fuel = 43 MJ/kg Inlet temperature of cooling water = 15^0C Outlet temperature of cooling water = 75^0C Inlet temperature of water to exhaust gas calorimeter = 15^0C Outlet temperature of water to exhaust gas calorimeter = 55^0C Final temperature of the exhaust gases = 80^0C Room temperature = 17^0C Air fuel ratio on mass basis = 20 Means specific heat of exhaust gas = 1 kJ/kgK Specific heat of water = 4.18 kJ/kgK Draw heat balance sheet and estimate thermal efficiency and mechanical efficiency.

University of Mumbai

Examination 2020 under cluster 09 (Lead College: FAMT)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Auto_V_A Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: AEC502 and Course Name: Mechanical Measurements and Control

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In a generalized measurement system, the function of the signal manipulating element is to _____
Option A:	change the input into an analogous signal.
Option B:	change the magnitude of the signal preserving its nature.
Option C:	perform liner operations like addition and multiplication.
Option D:	perform non-linear operations like filtering, chopping and clamping.
2.	A dead zone in a certain pyrometer is 0.125 percent of span. The calibration is 400 to 1000 degree C. What temperature change might occur before it is detected?
Option A:	0.125 degree C
Option B:	0.5 degree C
Option C:	0.75 degree C
Option D:	0.875 degree C
3.	In a parallel circuit having two branches, the currents in the branches are I1=100±2A and I2=200±5A. Determine the error in the total current I=I1+I2 considering errors in I1 and I2 as limiting errors.
Option A:	3 A
Option B:	5 A
Option C:	7 A
Option D:	10 A
4.	LVDT is which type of transducer _____
Option A:	Capacitive type
Option B:	Inductive type
Option C:	Resistive type
Option D:	Null type
5.	A stroboscope is used for measurement of_____ _____.
Option A:	Angular Velocity
Option B:	Pressure
Option C:	Strain

Option D:	Flow
6.	A resistance wire strain gauge uses a soft iron wire of small diameter. The poison's ratio is 0.5. Calculate the gauge factor neglecting piezoresistive effects.
Option A:	1
Option B:	2
Option C:	3
Option D:	4
7.	In thermal conductivity gauges, major source of error is heat lost because of _____.
Option A:	Conduction
Option B:	Convection
Option C:	Radiation
Option D:	Both Conduction & Radiation
8.	A flowmeter that measures flow rates which are independent of density is_____
Option A:	venturi meter
Option B:	orifice meter
Option C:	rotameter
Option D:	electromagnetic flow meter
9.	In temperature measurement RTD stands for _____.
Option A:	Resistance Temperature Detector
Option B:	Resistance Temperature Device
Option C:	Radiation Temperature Detector
Option D:	Radiation Temperature Device
10.	Which of the following is not a closed loop system?
Option A:	toaster machine
Option B:	oven
Option C:	missile
Option D:	servomechanism
11.	In a block diagram, the blocks in series are combined by _____
Option A:	addition
Option B:	subtraction
Option C:	multiplication
Option D:	division
12.	Transfer function of the system is defined as the ratio of Laplace of output to the Laplace of input considering initial conditions_____.
Option A:	zero
Option B:	unity
Option C:	unknown
Option D:	infinite

13.	Laplace transform of unit step signal is ____.
Option A:	A
Option B:	1
Option C:	1/S
Option D:	A/S
14.	Control system are normally designed to be ____.
Option A:	Overdamped
Option B:	Under damped
Option C:	Undamped
Option D:	Critically damped
15.	For a unity feedback system having G(S)=40 (S+2) / S (S+1) (S+4), the value of position error coefficient is _____.
Option A:	0
Option B:	20
Option C:	40
Option D:	∞
16.	For the loop transfer function G(S) H(S) = K(S+6) / (S+3) (S+5). The centroid in the root locus will be located at ____
Option A:	-1
Option B:	-2
Option C:	-3
Option D:	-4
17.	The phase angle at gain crossover frequency is estimated to be -120 degree. What will be the value of phase margin?
Option A:	20 degree
Option B:	60 degree
Option C:	80 degree
Option D:	100 degree
18.	Which of the following method is not used for stability analysis of a control system?
Option A:	Block diagram
Option B:	Root locus
Option C:	Bode plot
Option D:	Nyquist plot
19.	If non-repeated roots of the characteristics for a system are lying on the imaginary axis in s-plane, the system will be _____
Option A:	Stable
Option B:	Marginally stable
Option C:	Unstable
Option D:	Conditionally stable
20.	The analysis of MIMO system is conveniently studied by _____
Option A:	Routh array

Option B:	Root locus approach
Option C:	Characteristic equation approach
Option D:	State space analysis

Q2	
A	**Solve any Two** **5 marks each**
i.	Explain the various methods of correction for interfering and modifying inputs.
ii.	A stain gauge is made of material having a resistance temperature coefficient of 12 x 10^{-6} / ^{0}C. It has a resistance of 120 Ω and a gauge factor of 2. It is connected in a bridge circuit having resistance of 120 Ω each. The bridge is balanced at ambient temperature. Suppose there is a change of 20 ^{0}C in the temperature of the gauge. Find the output voltage of the bridge if the input voltage is 10 V.
iii.	Explain various laws of thermocouples (Thermoelectric laws)
B	**Solve any One** **10 marks each**
i.	Explain the various operational amplifier circuits used in instrumentation.
ii.	The discharge coefficient C_d of an orifice can be found by collecting the water that flows during a time interval when it is under a constant head h. $$C_d = \frac{W}{t\,\rho\,A\,\sqrt{2\,g\,h}}$$ Find C_d and its possible error if; W= 392 ± 0.23 kg, t = 600 ± 2 s, ρ = 1000 ± 0.1 % kg/m^3, $A = \frac{\pi}{4}\,d^2 \times 10^{-6}$ m^2, g = 9.81 ± 0.1 % m/s^2, h = 3.66 ± 0.003 m, d = 12.5 ± 0.025 mm. Consider both the following: a) The errors are the absolute limits, b) The errors are ± 3σ limits.

Q3	
A	**Solve any Two** **5 marks each**
i.	Compare between open loop and closed loop control systems.
ii.	Obtain the state space representation for the system having transfer function; $$\frac{Y(S)}{U(S)} = \frac{160\,(S+4)}{S^3 + 18S^2 + 192\,S + 640}$$
iii.	Explain the process reaction curve method of PID controller tunning.
B	**Solve any One** **10 marks each**
i.	For a unity feedback system having, G(S)=36 / S (S+0.72), determine characteristic equation and hence calculate damping ratio, peak time, settling time, peak overshoot and number of cycles completed before output settles for unit step input.

ii.	Examine the stability using Routh's criterion of a control system having characteristic equation: $S^5+4S^4+2S^3+8S^2+S+4=0$

University of Mumbai

Examination 2020 under cluster 9 (Lead College: FAMT)

Examinations Commencing 7th January 2021 to 20th January 2021

Program: Automobile Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: AEC503 and Course Name: HEAT TRANSFER

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions carry equal marks**
1.	Unit of heat transfer coefficient 'h' is
Option A:	J/kg.K
Option B:	J/K
Option C:	J.ohm/sec.K^2
Option D:	W/m^2.K
2.	The Equivalent thermal resistance 'R' when thermal resistance 'R1' and 'R2' are in series is
Option A:	R=R1+R2
Option B:	R=R1 x R2
Option C:	R=(R1 x R2)/(R1+R2)
Option D:	R=R1/R2
3.	Which following term is not the assumption of Fourier's equation of heat conduction
Option A:	Constant temperature gradient
Option B:	Uniform area of cross section
Option C:	Steady heat flow
Option D:	Homogeneous substance
4.	For steady state, no internal heat generation, unidirectional heat flow in radial direction and constant value of thermal conductivity, the temperature distribution associated with radial conduction through a hollow cylinder is
Option A:	Linear
Option B:	Logarithmic
Option C:	Parabolic
Option D:	Exponential
5.	A furnace is made of a red brick wall of thickness 0.5 m and conductivity 0.7 W/mK. For the same heat loss and temperature drop, this can be replaced by a layer of diatomite earth of conductivity 0.14 W/mK and thickness
Option A:	0.05 m
Option B:	0.2 m
Option C:	0.1 m
Option D:	0.5 m

6.	The ratio of "actual heat transferred by the fin to maximum heat that would be transferred if whole surface of fin is maintained at the base temperature" is called
Option A:	Fin efficiency
Option B:	Fin parameter
Option C:	Fin factor
Option D:	Fin effectiveness
7.	The time constant of a thermocouple is
Option A:	Time taken to attain 50% of initial temperature difference
Option B:	Time taken to attain 99% of initial temperature difference
Option C:	Time taken to attain 36.8% of initial temperature difference
Option D:	Time taken to attain 42.6% of initial temperature difference
8.	Fourier number may be expressed as
Option A:	Ratio of buoyancy to viscous forces
Option B:	Ratio of gravitational and surface tension forces
Option C:	Ratio of internal thermal resistance of a solid to the boundary layer thermal resistance
Option D:	Ratio of the rate of heat conduction to the rate of thermal energy storage in the solid.
9.	Calculate Reynolds number for the following case : Water flows through pipe, diameter 0.02m. Density of water is 1000 kg/m^3. Velocity 0.02 m/s. Viscosity is 0.001002 kg/ms.
Option A:	5970
Option B:	2988
Option C:	399
Option D:	10
10.	In convective heat transfer situation , Reynolds number(Re) is very large but Prandtl number(Pr) is so small that the product Re x Pr is less than one .In such a situation
Option A:	Thermal boundary layer does not exist
Option B:	Viscous boundary layer thickness equals to thermal boundary layer thickness
Option C:	Viscous boundary layer thickness is less than the thermal boundary layer thickness
Option D:	Viscous boundary layer thickness is greater than the thermal boundary layer thickness
11.	According to Buckingham's π theorem, if number of variables is 7 and number of basic dimensions is 4, then
Option A:	Number of nondimensional groups is 3
Option B:	Reference variables will be 5
Option C:	Reference variables will be 2
Option D:	No nondimensional groups will be formed
12.	Which of the following is the example of free convection-
Option A:	Pumping water inside the condenser tubes

Option B:	Air flow due to fan over a hot food
Option C:	Hot steel ball held in still air
Option D:	Blower forcing the air over hot surface
13.	A Plate is maintained at 50 deg Celsius is held in atmosphere of 10 deg Celsius .Coefficient of thermal expansion 'Beta' in this case is
Option A:	0.001 K^{-1}
Option B:	0.0033 K^{-1}
Option C:	0.0055 K^{-1}
Option D:	0.0123 K^{-1}
14.	If 'G' is irradiation and 'J' is the radiosity, the net radiation leaving the surface is
Option A:	J
Option B:	G
Option C:	G - J
Option D:	J - G
15.	The monochromatic emissive power of a black body with increasing wavelength
Option A:	Decreases
Option B:	Increases
Option C:	Increases, reaches a maximum and then decreases
Option D:	Decreases ,reaches a minimum and then increases
16.	For a radiation shield which of the following parameters should be highest?
Option A:	Emissivity
Option B:	Reflectivity
Option C:	Absorptivity
Option D:	Transmissivity
17.	Convective coefficients for boiling and condensation usually lie in the range
Option A:	30-300 W/m^2 K
Option B:	60-3000 W/m^2 K
Option C:	300- 10000 W/m^2 K
Option D:	2500- 10000 W/m^2 K
18.	A heat exchanger with heat transfer area 'A' and overall heat transfer coefficient 'U' handles two fluids of heat capacities C_{max} and C_{min} . The parameter NTU (number of transfer units) used in the analysis of heat exchanger is specified as
Option A:	AU / C_{min}
Option B:	AUC_{min}
Option C:	U / AC_{min}
Option D:	AC_{min} / U
19.	In pool boiling, the heat flux becomes maximum towards the end of
Option A:	Free convection boiling regime

Option B:	Nucleate boiling regime
Option C:	Unstable film boiling regime
Option D:	Stable film boiling regime
20.	Air is best heated with steam in a heat exchanger of
Option A:	Plate type
Option B:	Double pipe type with fin on steam side
Option C:	Double pipe type with fin on air side
Option D:	Shell and tube type

Q2 .	**Solve Any Four out of Six** **5 marks each**
A	Define thermal conductivity. What is the effect of temperature on thermal conductivity of metals and non-metals
B	What is Thermal boundary layer? Illustrate the thermal boundary layer formed during flow of cold fluid over a hot plate with the help of a neat diagram.
C	A circular ice rink 25 m in diameter is enclosed by a hemispherical dome 35 m in diameter. If the ice and dome surfaces may be approximated as blackbodies and are at 0^0C and 15^0C,respectively, what is the net rate of radiative heat transfer from the dome to the ice rink.?
D	Derive the expression for critical radius of insulation for cylinder with usual notations.
E	A spherical shaped vessel of 1.4 m diameter is 90 mm thick. Find the rate of heat leakage ,if the temperature between the inner and outer surfaces is 220^0C.Thermal conductivity of the material of the sphere is 0.083W/m^{0}C
F	Define Intensity of radiation. What is a solid angle. What is its unit?

Q3.	**Solve Any Two Questions out of Three** **10 marks each**
A	Explain Thermowell (i.e. Thermometer well) with neat sketch and estimate the error in temperature measurement in Thermowell (i.e. Thermometer well) by assuming a thermowell to be a fin with insulated end using usual notations.
B	Water preheater consists of an iron pipe with an inner diameter of 3.2 cm and outer diameter 3.52 cm .The pipe is externally heated by a steam at a temperature of 180^0C.Water flows through the tubes with a velocity 1.2 m/s .If the heat transfer coefficient on steam side is 11000W/m^{2}K,find length of the pipe required to heat water from 25^0C to 95^0C.

	Use $Nu=0.023Re^{0.8} Pr^{0.4}$ For pipe material k= 59 W/mK Properties of water at 60^0C are => $\nu = 0.4762 \times 10^{-6}$ m^2/s ,k = 0.653 W/mK, Cp= 4200J/kgK, ρ= 1000 kg/m^3
C	A chemical having specific heat of 3.3 kJ/kg.K flowing at the rate of 20000 kg/h enters a parallel flow heat exchanger at 120^0C.The flow rate of cooling water is 50000 kg/h with an inlet temperature of 20^0C. The heat transfer area is 10 m^2 and the overall heat transfer coefficient is 1050 W/m^2K .Find – i) Effectiveness of heat exchanger ii) The outlet temperature of water and chemical. Take C_p of water as 4.186 kJ/kg.K

University of Mumbai

Examination 2020 under cluster 8 (Lead College: PHCET, Rasayani)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Automobile Engineering

Curriculum Scheme: Rev 2016

Examination: TE Semester V

Course Code: AEC504 Course Name: Automotive Systems

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What type of clutch among the following is automatic?
Option A:	Single plate clutch
Option B:	Multi plate clutch
Option C:	Centrifugal clutch
Option D:	Diaphragm type single plate clutch
2.	In case of single plate clutch, the force that keeps clutch in engaged position is exerted by ……
Option A:	Diaphragm spring
Option B:	Torsional spring
Option C:	Hydraulic cylinder
Option D:	Pneumatic cylinder
3.	Which component of the clutch assembly reduces the jerk at the time of engagement?
Option A:	Thrust bearing
Option B:	Axial spring
Option C:	Friction facing
Option D:	Cushion spring
4.	In which type of manual transmission the double-declutching is used?
Option A:	Constant-mesh gearbox
Option B:	Fluid flywheel
Option C:	Synchromesh gearbox
Option D:	Epicyclical gearbox
5.	Complete the sentence with correct option. The principle of equalizing the speeds in the synchromesh gear box is based on …….
Option A:	Friction
Option B:	Magnetism effect
Option C:	Abrasion
Option D:	Wobbling
6.	What types of gear are used in sliding mesh gearbox?
Option A:	Helical Gears

Option B:	Compound Gears
Option C:	Spur Gears
Option D:	Sun & Planet Gears
7.	Which member in the epicyclic gear box embraces the whole assembly?
Option A:	Sun Gear
Option B:	Ring Gear
Option C:	Planet pinion
Option D:	Planet Carrier
8.	Why slip joint is necessary in Hotchkiss drive system?
Option A:	To vary the length of gear box output shaft
Option B:	To vary the length of universal joint
Option C:	To vary the length of propeller shaft
Option D:	To vary the length of suspension system
9.	In which transmission dual clutch is used?
Option A:	CVT
Option B:	Direct shift gear box
Option C:	Synchromesh gear box
Option D:	Epicyclic Gear box
10.	Which of the following layouts is not used in motor vehicles?
Option A:	Front engine front wheel drive
Option B:	Front engine rear wheel drive
Option C:	Rear engine front wheel drive
Option D:	Rear engine rear wheel drive
11.	Complete the sentence with correct option. A two-piece propeller shaft requires ……..
Option A:	Only one universal joint
Option B:	Four universal joints
Option C:	Shaft to be solid
Option D:	A centre support bearing
12.	What is the purpose of tire rotation on automobiles?
Option A:	Avoid ply separation
Option B:	Equalize wear
Option C:	Get better ride
Option D:	Reduce bump
13.	In case of disc brake system, why holes are provided on the disc?
Option A:	To reduce the calliper weight
Option B:	To provide attractive look
Option C:	To increase the cooling effect
Option D:	To decrease the cooling effect
14.	What helps to control the body roll?
Option A:	Stabilizer bar
Option B:	Helper spring

Option C:	Torsion spring
Option D:	Ball Joint
15.	In case of Macpheson strut suspension, where does the upper end of the strut attach?
Option A:	Upper wishbone
Option B:	Vehicle body
Option C:	Vehicle chassis
Option D:	Axle
16.	What happens inside the master cylinder when brake pedal is pressed by driver?
Option A:	Brake shoes expand
Option B:	Disc starts rotating
Option C:	Oil pressure reduces due to movement of push rod
Option D:	Oil pressure increases due to movement of push rod
17.	Complete the sentence with correct option. A clutch is usually designed to transmit maximum torque which is ……..
Option A:	Equal to the maximum engine torque
Option B:	80% of the maximum engine torque
Option C:	150% of the maximum engine torque
Option D:	Less than maximum engine torque
18.	When gearbox output shaft is rotating in opposite direction as compared to the clutch shaft, what gear combination it is?
Option A:	Reverse Gear
Option B:	Neutral Gear
Option C:	Direct Gear
Option D:	First Gear
19.	What is the name of the angle through which the wheel has to turn to sustain the side force?
Option A:	Slip angle
Option B:	Castor angle
Option C:	Camber
Option D:	Kingpin inclination
20.	The tilting of the front wheels away from the vertical is called as ……
Option A:	caster
Option B:	camber
Option C:	toe-in
Option D:	toe-out

Q2	**Solve any Four out of Six** **(05 marks each)**
A	What are the functional requirements of the clutch?
B	How the drawback of constant mesh gearbox is overcome in synchromesh gear box. Explain in detail.
C	Explain the importance of universal joint in automobile.
D	Write short note on rear axle construction.

E	Write short note on air brake system.
F	Write short note on recirculating ball type steering gear.

Q3	**Solve any Four out of Six** **(05 marks each)**
A	Write short note on multi-plate clutch
B	Write short note on CVT
C	Write short note on tandem axle drive for heavy vehicles.
D	Write short note on four wheel drive lay out.
E	Write short note on types of suspension spring
F	Write short note on tyre construction.

University of Mumbai

Examination 2020 under cluster 9 (Lead College: FAMT)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Automobile Engineering**

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: **AEDLO5013** and Course Name: **Design of Jigs and Fixtures**

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Jigs & fixtures eliminate individual marking, positioning & frequent checking, due to this it increases _____.
Option A:	productivity
Option B:	interchangeability
Option C:	skill
Option D:	cost
2.	Which of the following statement is not true?
Option A:	Use of jigs & fixtures increases productivity
Option B:	Use of jigs & fixtures facilitate interchangeability.
Option C:	Use of jigs & fixtures reduces the production cost.
Option D:	Use of jigs & fixtures increases inventory levels.
3.	Indexing facilitating accurate positioning of a part around its axis is called_____.
Option A:	Linear indexing
Option B:	Rotary indexing
Option C:	Angular indexing
Option D:	Axial indexing
4.	How many degree of freedom a workpieces in a space has?
Option A:	10
Option B:	12
Option C:	6
Option D:	4
5.	Milling Fixtures for horizontal machines should be able to bear thrust in the _____ direction.
Option A:	Vertical
Option B:	Horizontal
Option C:	Transverse
Option D:	Inclined
6.	The material selected for the manufacturing of jigs & fixtures should _____.
Option A:	be available cheaply
Option B:	have good machinability
Option C:	be brittle in nature

Option D:	be readily available.
7.	Which type of mandrels normally uses friction for clamping of workpiece?
Option A:	Axial Clamping
Option B:	Tapered
Option C:	Expanding
Option D:	Threaded
8.	Which of the following is not a locating device?
Option A:	Cam operated V
Option B:	Conical head
Option C:	Slotted strap
Option D:	Diamond pin
9.	To hold irregular workpiece for turning we can use _____.
Option A:	Three jaw chuck
Option B:	Four jaw chuck
Option C:	Collet
Option D:	Jigs
10.	The device which place the workpiece in the same position, in jig and fixture, cycle after cycle is called as
Option A:	Placing device
Option B:	Fixing device
Option C:	Locating device
Option D:	Positioning device
11.	Balance weight in the Turning fixture is used to
Option A:	To balance the workpiece
Option B:	To balance the fixture
Option C:	To support the workpiece
Option D:	To clamp the workpiece
12.	A conical locator has the advantage of
Option A:	easy location
Option B:	self-centering
Option C:	easy location and self-centering
Option D:	offers good grip
13.	Box jig allows the part to be completely machined on every surface without _____ to work
Option A:	Repositioning
Option B:	Reaming
Option C:	Re-Hardening
Option D:	Riveting
14.	In gang milling
Option A:	Several jobs can be performed in one step
Option B:	One job is completed on several milling machines located together
Option C:	Two or more cutters are mounted on the arbor and all of them remove the metal

	simultaneously
Option D:	More than one milling operations are carried out in one job on different machines
15.	Which operation is not possible to perform on indexing jig?
Option A:	Reaming
Option B:	Tapping
Option C:	Grinding
Option D:	Boring
16.	Drill jigs are used for
Option A:	Drilling, reaming, taping and other allied operations
Option B:	Drilling operations only
Option C:	Clamping the job when drilling
Option D:	Guiding the tool only
17.	Which of the component is not a part of milling fixture?
Option A:	Setting block
Option B:	Bushings
Option C:	Tennons
Option D:	Locating pins
18.	The supports should be located directly _____ the clamping force.
Option A:	Opposite
Option B:	Same side
Option C:	Adjacent
Option D:	on
19.	Collets are used for holding_____.
Option A:	Small bar
Option B:	Large work piece
Option C:	Rectangular work piece
Option D:	Irregular workpiece
20.	Hardening of drill jig bushing are normally done to
Option A:	Protect the jig from damage
Option B:	Ensure Prolonged life without wear and tear so as to guide the tool accurately
Option C:	Guide the tool so that it does not go inclined
Option D:	Allow the chips to come out easily

Q2	**Solve any Four out of Six** **5 marks each**
A	What are the main differences between a jig and fixture?
B	What is the six-point location principle? Explain with suitable sketches.
C	Name and explain any 5 common types of clamps.
D	List and explain any 3 different types of drilling bushes
E	Write short notes on “Broaching fixtures” & “Assembly Fixtures”.
F	Explain with aid of suitable sketches, the various indexing devices.

Q3	**Solve any Four out of Six** **5 marks each**
A	Explain any three types of Drill Jigs with neat sketches
B	Explain the working of Turning Fixtures.
C	Write short note on the concept of Nesting.
D	Write short note on Interchangeability of parts in Jigs and Fixtures
E	Explain the three different types of bodies used in Jigs/Fixtures.
F	Write a short note on Dividing Head using neat sketch.

University of Mumbai

Examination 2020 under cluster 9 (Lead College: FAMT)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: **Automobile Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester: V

Course Code: AEDLO5011 and Course Name: Press Tool Design

Time: 2 hour Max. Marks: 80

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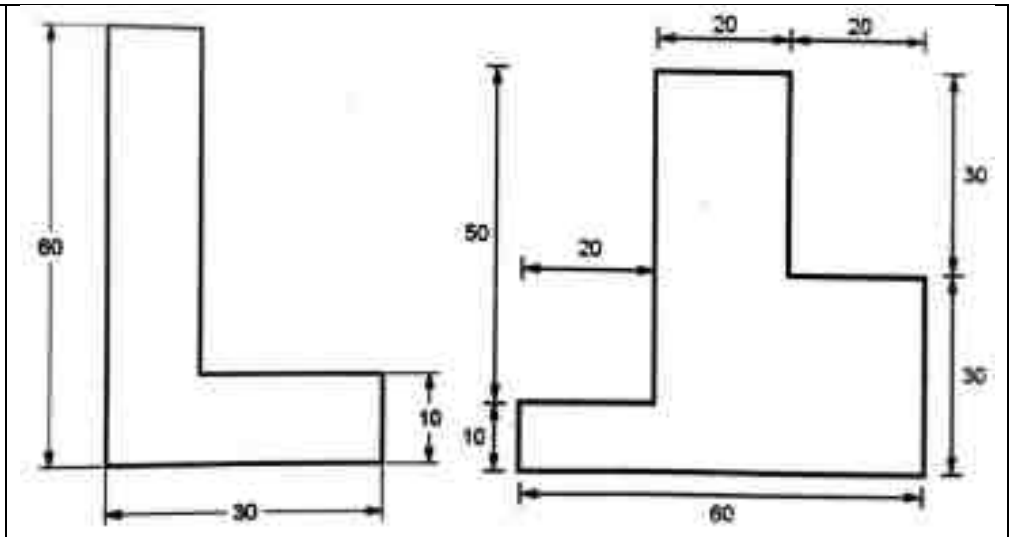
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following forming processes is suitable for making utensils and cup shaped objects?
Option A:	Forging
Option B:	Rolling
Option C:	Deep drawing
Option D:	Wire drawing
2.	To make a small indentation (centre hole) in sheet metal, a---------- is used.
Option A:	Pencil
Option B:	Centre Punch
Option C:	Needle
Option D:	Scriber
3.	"In compound dies....."
Option A:	Two or more cutting operations can be performed simultaneously
Option B:	Cutting and formation operations are combined and carried out in single operation
Option C:	Workpiece moves from one station to other with separate operation performed at each station
Option D:	Only one operation is performed at each stroke of the ram
4.	As the thickness of sheet is increased the clearance needed will also?
Option A:	First decreases and then Increase
Option B:	Decrease
Option C:	Increase
Option D:	No effect
5.	Wrinkling is a common defect found in
Option A:	Bent components
Option B:	Deep drawn components
Option C:	Embossed components
Option D:	Blanked component
6.	When sheet metal is to be bend at an angle from its edge then the process is

	called?
Option A:	V-bending
Option B:	Edge bending
Option C:	U-bending
Option D:	V and edge bending
7.	In Piercing operation the clearance is provided on following element
Option A:	On die
Option B:	50% on punch and 50% on die
Option C:	On Punch
Option D:	On die or punch depending upon designer's choice
8.	"A die which is used for removal of burrs and to flatten the edges of precision parts. "
Option A:	Simple die
Option B:	Trimming die
Option C:	Shaving die
Option D:	Compound die
9.	The angle of inclination is given on a die or punch for reducing cutting forces is called as
Option A:	Staggering of punches
Option B:	Relief angle
Option C:	Angle of Shear
Option D:	Taper angle
10.	layout the position of the workpieces in the strip and their orientation with respect to one another is called as
Option A:	Feed layout
Option B:	Design layout
Option C:	Plant layout
Option D:	Scrap strip layout
11.	If depth of formed cup is up to half its diameter the process is called ….
Option A:	Forced drawing
Option B:	Hollow drawing
Option C:	Deep drawing
Option D:	Shallow drawing
12.	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
13.	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
14.	Following operation is used for cutting very small holes very close together in a workpiece.
Option A:	Shaving
Option B:	Perforating
Option C:	Lancing
Option D:	Trimming
15.	Which of the following is known as sheet metal worker's pencil
Option A:	Divider
Option B:	Chisel
Option C:	Scriber
Option D:	Center punch
16.	For strippers, following material is used.
Option A:	Aluminum
Option B:	Copper
Option C:	Cold rolled mild steel
Option D:	Cast iron
17.	In presses, die block is mounted on following element
Option A:	Upper Shoe
Option B:	Lower Shoe
Option C:	Stripper plate
Option D:	Stock guide
18.	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
19.	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
20.	A device which is used to advance the strip in a correct distance over a die is called
Option A:	Stock guide
Option B:	Pilots
Option C:	Stock stop
Option D:	Knockout plate

Q2. **(20 Marks)**	**Attempt any Four out of Six Questions** **(5 marks each)**
A	Classify press working operations and explain notching operation with a neat diagram
B	Differentiate between blanking operation and piercing operation
C	What is spring back in bending operation and explain anyone method to compensate the spring back.
D	Explain working and construction of embossing die.
E	Differentiate between compound die and combination die
F	Write safety precautions taken in the press shop.

Q3. **(20 Marks)**	**Solve any Two out of Three Questions** **(10 marks each)**
A	Find the total pressure, dimensions of tools to produce a washer of 5.5 cm outer diameter with 2.5 cm diameter hole, from a material of 4 mm thickness, having shear strength of 350 N/mm^2. (Assume Clearance 10% of stock thickness)
B	A symmetrical-cup workpiece with a height of 50 mm and a diameter of 50 mm, the inner corner radius is 1.6 mm. The workpiece material is cold-rolled steel of 0.8 mm thick. Make necessary calculations for designing the drawing die for this part.
C	Find the centre of pressure for the following blanks.

	 60 10 30 30 20 50 20 30 10 30 60

University of Mumbai

Examination 2020 under cluster 9 (Lead College: FAMT Ratnagiri)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: **Automobile** Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code:AEDLO5012 and Course Name: Machining Science and Tool Design

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In an Orthogonal Cutting Process, the tool was found to have rake angle of 0^o. Which one of the following statements is true?
Option A:	Magnitudes of frictional and thrust force are zero.
Option B:	Frictional and thrust forces are equal in magnitude.
Option C:	Frictional force is half of thrust force in magnitude.
Option D:	Frictional force is double of thrust force in magnitude.
2.	The velocity of chip flow during an orthogonal machining process is observed to be 2 m/s. If the chip thickness ratio is 0.5 what is the magnitude of cutting velocity?
Option A:	4 m/s
Option B:	2 m/s
Option C:	0.4 m/s
Option D:	0.2 m/s
3.	In the idealized simplified model of chip formation, the shear strain, ε, is given by
Option A:	$\cot\phi + \tan(\phi + \gamma)$
Option B:	$\cot\gamma + \tan(\phi - \gamma)$
Option C:	$\cot\phi + \tan(\phi - \gamma)$
Option D:	$\cot\gamma + \tan(\phi + \gamma)$
4.	Which one of the following is a requirement of a good dynamometer?
Option A:	Dynamometer need to be very flexible.
Option B:	A dynamometer should be stable with respect to time, temperature, and humidity.
Option C:	It is convenient to use a dynamometer having a non-linear calibration
Option D:	A dynamometer should have a cross-sensitivity while measuring force components along 3 coordinate axes.
5.	The ideal cutting fluid for low speed machining of metals should be one which
Option A:	Removes the Heat Faster from Cutting Zone
Option B:	Forms the coating on cutting Tool by chemical reaction
Option C:	Forms a Low shear strength film of work material at tool chip interface
Option D:	Serves as Dielectric minimizing there by reaction due to emf at the interface

6.	No Cutting fluid normally used for machining
Option A:	Aluminium
Option B:	Cast iron
Option C:	alloy steel
Option D:	Low carbon steel
7.	Secondary deformation zone in metal cutting operation is located at
Option A:	Around shear plane
Option B:	Tool work piece interface
Option C:	Tool chip interface
Option D:	Tool face
8.	If a percentage of cobalt in Tungsten carbide tool increases, then toughness of tool will
Option A:	Increase
Option B:	Decrease
Option C:	Remains Constant
Option D:	First increase then decrease
9.	Which of the following material can be used for coating on tools?
Option A:	HSS
Option B:	TiCN
Option C:	WC
Option D:	CBN
10.	Which of the following is not true?
Option A:	Increasing the tool rake angle generally improves surface finish
Option B:	Higher work material hardness results in better surface finish
Option C:	Tool material has minor effect on surface finish.
Option D:	Higher work material hardness results in poor surface finish
11.	Cutting tool is much harder than the work piece. Yet the tool wears out during the tool-work interaction, because
Option A:	Extra hardness is imparted to the work piece due to coolant used
Option B:	oxide layers on the workpiece Surface impart extra hardness to it
Option C:	Extra hardness is imparted to the workpiece due to severe rate of strain
Option D:	Vibration is induced in the machine tool
12.	Crater wear occurs mainly on the
Option A:	Nose part, front relief face and side relief face of the cutting tool
Option B:	Face of the cutting tool at a short distance from the cutting edge only
Option C:	Cutting edge only
Option D:	Front face only
13.	Using the Taylor's tool life equation with exponent n=0.5, if the cutting speed is reduced by 50%, the ratio of new tool life to original tool life is
Option A:	4
Option B:	2
Option C:	1
Option D:	0.5

14.	Angle between side cutting edge and axis of tool is known as
Option A:	Side rake angle
Option B:	Side relief angle
Option C:	Side cutting edge angle
Option D:	Back rake angle
15.	A cutting tool can never have its
Option A:	rake angle – positive
Option B:	rake angle – negative
Option C:	clearance angle – positive
Option D:	clearance angle – negative
16.	Angle on which strength of the tool depends is
Option A:	lip angle
Option B:	rake angle
Option C:	cutting angle
Option D:	clearance angle
17.	What is broaching?
Option A:	A machining process used for increasing the size of the existing hole
Option B:	A machining process used for grinding hardened steel
Option C:	A machining process used for making intricate holes accurately
Option D:	A machining process for removal of a layer of material of desired width and depth
18.	Why push type broaches are made shorter in length?
Option A:	To reduce machining time
Option B:	To increase the efficiency
Option C:	For easy handling of the tool
Option D:	To avoid buckling
19.	Which of the following type of broaches are sharpened or re-sharpened by grinding at the flank surfaces?
Option A:	Profile sharpened type
Option B:	Sectional type
Option C:	Segmented type
Option D:	Ordinary cut type
20.	Which of the following milling cutters can be used for formation of V-grooves?
Option A:	Angle milling cutters
Option B:	Form milling cutters
Option C:	Gear cutters
Option D:	Woodruff-key cutter

Q2.	
A	**Solve any Two** **5 marks each**
i.	Short Note on Orthogonal and Oblique Cutting
ii.	Explain Sources of Heat in Metal Cutting
iii.	What are Effect of cutting Parameters on Tool Life
B	**Solve any One** **10 marks each**
i.	*In orthogonal metal cutting following observation were made 1)cutting Speed =0.76m/s,2)rake angle=15^0,3)Feed=0.13mm/revolution,4)depth of cut=2.65mm,5)Chip thickness=0.323mm,6)F_H=818.8 N &Fv=445N.* Find 1)Shear Angle 2)Shear Strain 3)Coefficient of Friction 4)Shear Stress.
ii.	Write Design Procedure of Shank of Single point Cutting Tool

Q3.	
A	**Solve any Two** **5 marks each**
i.	Draw Merchant Circle Diagram with usual Notation and Enlist all Forces
ii.	Short note on Properties of Cutting Tool Materials
iii.	Explain the constructional features of tipped Tools
B	**Solve any One** **10 marks each**
i.	What do you mean by shear plane and shear plane angle? Derive expression for shear angle in terms of rake angle and chip thickness ratio
ii.	Explain Cutting Fluids Types, Its function and Classification