SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan – June 2020	Month- February
Semester- 4th	Subject- Applied Thermodynamics	
Code – 337453(37)	Time Allowed: 2 hrs	Max Marks: 40

Note: - 1. Students are Required to focus on question and marks columns only

Q. No	**Questions**	**Marks**	Levels of Bloom's taxonomy	CO
	Unit – I (Question A is compulsory, attempt any two parts out of B, C and D)			
1.A	Define the M.E.P. (Mean Effective Pressure) and derive the expression for same.	**04**	Remembering	CO1
1.B	Derive the thermal efficiency expression for compression ignition cycle with depiction on P-V & T-S diagram	**08**	Applying	CO1
1.C	In a constant volume 'Otto cycle' the pressure at the end of compression is 15 times than at the start, the temperature of air at the beginning of compression is 38°C and maximum temperature attained in the cycle is 1950°C. Determine: (i) Compression ratio. (ii) Thermal efficiency of the cycle. (iii) Work done. Take Y for air = 1.4.	**08**	Applying	CO1
1.D	(i) An engine working on Otto cycle, in which the salient points are 1, 2, 3 and 4, has upper and lower temperature limits T_3 and T_1. If the maximum work per kg of air is to be done, show that the intermediate temperature is given by. $T_2 = T_4 = \sqrt{T_1 T_3}$. (ii) If an engine works on Otto cycle between temperature limits 1450 K and 310 K, find the maximum power developed by the engine assuming the circulation of air per minute as 0.38 kg.	**08**	Applying	CO1

Unit – II(Question A is compulsory, attempt any two parts out of B, C and D)				
2.A	What is volumetric efficiency & explain it's significance.	**04**	Remembering	CO2
2.B	An air compressor takes in air at 1 bar and 20°C and compresses it according to law $pv^{1.2}$ = constant. It is then delivered to a receiver at a constant pressure of 10 bar. R = 0.287 kJ / kg K. Determine: (i) Temperature at the end of compression. (ii) Work done and heat transferred during compression per kg of air.	**08**	Applying	CO2
2.C	Derive the expression for work for a single cylinder, single acting compressor with clearance.	**08**	Applying	CO2
2.D	A single-stage, double- acting compressor has a free air delivery (F.A.D.) of 14 m^3 / min. measured at 1.013 bar and 15°C. The pressure and temperature in the cylinder during induction are 0.95 bar 32°C. The delivery pressure is 7 bar and index of compression and expansion, n = 1.3. The clearance volume is 5% of the swept volume. Calculate: (i) Indicated power required. (ii) Volumetric efficiency.	**08**	Applying	CO2

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DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan – June 2020	Month- February
Sem- 4th	Subject- Numerical Analysis & Computer Programming	
Code - 337455(37)	Time Allowed: 2 hrs	Max Marks: 40

Note: - 1. Students are Required to focus on question and marks columns only.
2. In Unit I & II, Question A is compulsory and attempt any two from B, C & D.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	What is the role of Numerical Analysis in the field of research and development?	4	Understand	CO1
1.B	Find the Negative root of $x^3 - 4x + 9 = 0$ with the help of Bisection method.	8	Apply	CO1
1.C	Find the positive root of $xe^x = 2$ by using method of false position.	8	Apply	CO1
1.D	A bacteria concentration in a reservoir varies as $0.5 = 4e^{-2t} + e^{-0.1t}$ using Newton Raphson Method , Calculate the time required t for bacteria concentration.	8	Apply	CO1

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – II			
2.A	Find out the iterative formula for the value of $n^{0.5}$ by using Newton Raphson Method.	4	Apply	CO1
2.B	Solve the following system of equations by Gauss Seidel Method – $x + y + 54z = 110$ $27x + 6y - z = 85$ $6x + 15y + 2z = 72$	8	Apply	CO2
2.C	Solve the following system of equations by Gauss Elimination Method – $x + 2y + z = 3$ $2x + 3y + 3z = 10$ $3x - 15y + 2z = 13$	8	Apply	CO2
2.D	Solve the following system of equations by Gauss Jordan Method – $10x + y + z = 12$ $2x + 10y + z = 13$ $x + y + 5z = 7$	8	Apply	CO2

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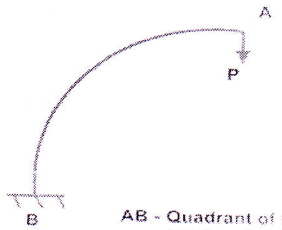
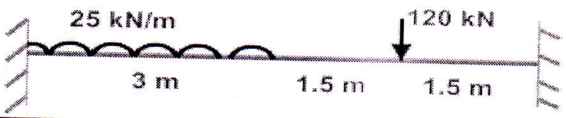
DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- Jan – June 2020	Month- February
Sem- 4th	Subject- Mechanics of solids -II	
Code - 337452(37)	Time Allowed: 2 hrs	Max Marks: 40

Note: - 1. In Unit I & II, Question A is compulsory and attempt any two from B, C & D.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	Explain (a) Proof resilience (b) Strain energy due to torsion	4	Remember	CO1
1.B	State and prove Castigliano's theorem	8	Understanding	CO1
1.C	A 500 mm x 180 mm mild steel beam is simply supported on span of 6 m. A load of 20 kN is applied on the middle from height of 12.5 mm. Find the deflection and bending stress induced. Take E = 200 GPa I= 4.522×10^8 mm4	8	Applying	CO1
1.D	For structure shown in figure find the horizontal and vertical deflection of point A  AB - Quadrant of circle (radius r)	8	Applying	CO1
	Unit – II			
2.A	Define statically indeterminate beam with two examples	4	Remember	CO2
2.B	For fixed beam shown in figure find the support reactions, fixing moments and draw bending moment diagram 	8	Applying	CO2
2.C	A fixed beam having length of 6 m is subjected to point load of 200 kN at 2 m from left support and 150 kN at 2 m from right support. find the support reactions, fixing moments and draw bending moment diagram	8	Applying	CO2
2.D	A fixed beam having length of 10 m is subjected to point load of 180 kN at 3 m from left support and clockwise couple of 160 kNm at 4 m from right support. find the support reactions, fixing moments and draw bending moment diagram	8	Applying	CO2

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DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan – June 2020	Month- February
Sem- 4th	Subject- MS-I	
Code –337456(37)	Time Allowed: 2 hrs	Max Marks: 40

Note: Question 1 is compulsory, attempt any two from 2, 3,4.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Section - I			
1.A	Why draft is provided on pattern?	4	R	CO1
1.B	Explain the gating system with diagram.	8	U	CO1
1.C	Discuss the different type of casting defects and its causes and remedies.	8	U	CO2
1.D	Discuss the following A) Hot chamber die casting. B) Cold chamber die casting	8	U	CO2

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Section – II			
2.A	Define welding process.	4	R	CO3
2.B	Write short notes on (any two) a) Investment casting b) Shell molding c.) Properties of molding sand	8	U	CO2
2.C	Discuss Oxy acetylene welding and types of flame.	8	U	CO3
2.D	What are Allowances? Explain different types of Allowances.	8	U	CO3

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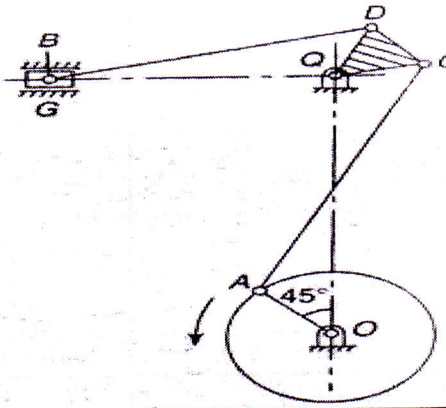
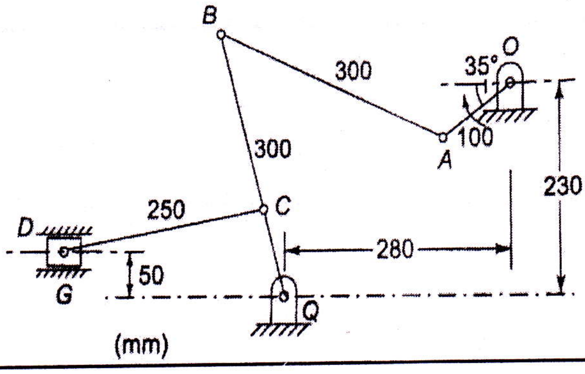
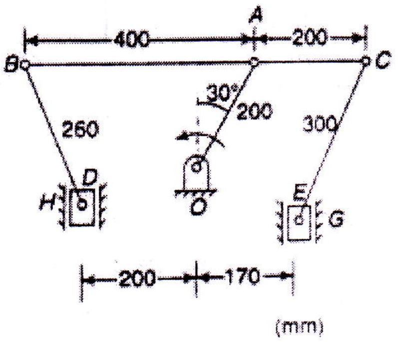
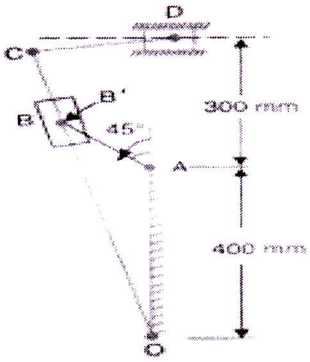
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- January – June 2020	Month- February
Semester- 4^{th}	Subject- Kinematics of Machines	
Code – 337454(37)	Time Allowed: 2 hrs	Max Marks: 40

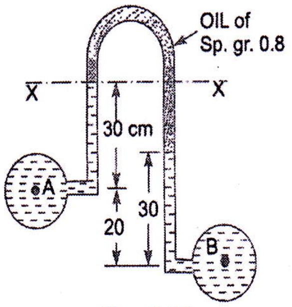
Note: - Students are required to focus on question and marks columns only.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I (Q A is Compulsory attempt any two out of B.C and D)			
1.A	In a slider crank mechanism, Crank is 480mm long and rotates at 20 rad/s in counterclockwise direction. Length of connecting rod is 1.6m. When crank turns 60^0 from inner dead centre (IDC), determine (i) Velocity of slider (ii) Velocity of point E located at a distance of 450mm on the connecting rod extended (iii) Position and velocity of point F on the connecting rod having least absolute velocity.	**06**	Applying	CO1
1.B	The lengths of various links of a mechanism shown in figure are: OA=150mm, AC=600mm, CQ=QD=145mm, CD=125mm, BD=500mm, OQ=625mm. The crank OA rotates at 60rpm in the counter clockwise direction. Determine the velocity of the slider B and the angular velocity of link BD when the crank has turned an angle of 45^0 with the vertical. 	**10**	Applying	CO1
1.C	Figure shows a mechanism in which OA=QC=100mm, AB=QB=300mm and CD=250mm. The crank OA rotates at 150rpm in the clockwise direction. Determine the (i) velocity of slider at D (ii)angular velocity of links QB and AB. (Figure in Next Page) 	**10**	Applying	CO1

	Unit – I			
1.D	In the mechanism shown in figure,angular velocity of crank OA is 15 radian/sec the slider at E is constrained to move at 2.5m/s downwards. The motion of both the sliders is vertical and the link BC is horizontal in the position shown. Determine: (i) Rubbing velocity at B if the pin diameter is 15mm (ii) Velocity of slider D. 	**10**	Applying	CO1
	Unit – II (Attempt any one out of A and B)			
2.A	A mechanism of a crank and slotted lever quick return motion is shown in Figure. If the crank rotates counter clockwise at 120 rpm, determine for the configuration shown, the velocity and acceleration of the ram D. Also determine the angular acceleration of the slotted lever. Crank AB = 150 mm; Slotted arm OC = 700 mm and link CD = 200 mm. 	**14**	Applying	CO2
2.B	PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ=62.5mm, QR=175mm, RS =112.5mm and PS=200mm. Crank PQ rotates at 10rad/s clockwise. Draw velocity and acceleration diagrams when angle QPS=60^0 and Q and R lie on same side of PS. Find angular velocity and angular acceleration of link QR and RS.	**14**	Applying	CO2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Nov-Dec 2019-20	Month- February
Sem- 4th	Subject- Fluid Mechanics	
Code - 337451(37)	Time Allowed: 2 hrs	Max Marks: 40

Note: - 1. Students are Required to focus on question and marks columns only.
2. In Unit I & II, Question A is compulsory and attempt any two from B, C & D.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	Define the Newton's law of viscosity and Buoyancy force.	**4**	Understanding	1
1.B	Explain the stability condition of completely submerged and partially submerged body.	**8**	Understanding	2
1.C	A circular opening, 3m diameter in a vertical side of the tank is closed by a disc of 3m diameter which can rotate about an horizontal diameter. Calculate: (i)The force on the disc, and (ii) The torque required to maintain the disc in equilibrium in the vertical position when the head of water above the horizontal diameter is 4m.	**8**	Applying	2
1.D	In Fig an inverted differential manometer is connected to two pipes A and B which convey water. The fluid in manometer is oil of sp.gr. 0.8. For the manometer readings shown in the figure, Find the pressure difference  between A and B.	**8**	Applying	1

Unit – II				
2.A	. Explain Compressibilityandeffect of temperature on viscosity.	4	Remember	1
2.B	Derive an expression for Hydrostatic force and position of Centre of Pressure for vertical plane surface.	8	Understanding	2
2.C	A cubical block weighing 4.5 N and having a 40 cm edge is allowed to slide down an inclined plane surface making an angle of 300 with the horizontal on which there is a uniform layer of oil 0.005 cm thick. If the expected steady state velocity of the block is 12.5 cm/s, determine the viscosity of the oil. Also express the kinematics viscosity in stokes if the oil has a mass density 800 kg/m3.	8	Applying	2
2.D	A block of wood of specific gravity 0.7 floats in water Determine the meta-centric height of the block if its size is 2m×1m×0.8m. State whether the equilibrium is stable or unstable.	8	Applying	2

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Semester- 4th	Subject- Applied Thermodynamics	
Code – 337453(37)	Time Allowed: 2 hrs	Max Marks: 40

Note: - 1. Students are Required to focus on question and marks columns only

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
Unit – I (Question A is compulsory, attempt any two parts out of B, C and D)				
1.A	Define the M.E.P. (Mean Effective Pressure) and derive the expression for same.	**04**	Remembering	CO1
1.B	Derive the thermal efficiency expression for compression ignition cycle with depiction on P-V & T-S diagram	**08**	Applying	CO1
1.C	In a constant volume 'Otto cycle' the pressure at the end of compression is 15 times than at the start, the temperature of air at the beginning of compression is 38°C and maximum temperature attained in the cycle is 1950°C. Determine: (i) Compression ratio. (ii) Thermal efficiency of the cycle. (iii) Work done. Take Y for air = 1.4.	**08**	Applying	CO1
1.D	(i) An engine working on Otto cycle, in which the salient points are 1, 2, 3 and 4, has upper and lower temperature limits T_3 and T_1. If the maximum work per kg of air is to be done, show that the intermediate temperature is given by. $T_2 = T_4 = \sqrt{T_1\, T_3}$. (ii) If an engine works on Otto cycle between temperature limits 1450 K and 310 K, find the maximum power developed by the engine assuming the circulation of air per minute as 0.38 kg.	**08**	Applying	CO1