SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan – June 2020	Month- February
Sem- 6th	Subject- Heat and Mass Transfer	
Code –337654(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 over all Heat- Transfer coefficient.	**4**	Understanding	CO-2
1.B	A wall of a furnace is made up of inside layer of silica brick 120 mm thick covered with a layer of magnesite brick 240 mm thick. The temperatures at the inside surface of silica brick wall and outside surface of magnesite brick wall are 725°C and 110°C respectively. The contact thermal resistance between the two walls at the interface is 0.0035°C/W per unit wall area. If thermal conductivities of silica and magnesite bricks are 1.7 W/m°C and 5.8 W/m°C, calculate. (i) The rate of heat loss per unit area of walls, and (ii) The temperature drop at the interface.	**8**	Applying	CO-1
1.C	Hot gases at 1020°C flow past the upper surface of a gas turbine blade (the blade to be considered as a flat plate 1.2 mm thick) and the lower surface is cooled by air bled off the compressor. The thermal conductivity of blade material is 12 W/m°C and the heat transfer coefficients (convective) at the upper and lower surfaces are 2750 W/m°C and 1400 W/m°C respectively. Assuming steady state conditions have reached and the metallurgical considerations limit the blade temperature to 900°C, estimate the temperature of coolant-air.	**8**	Applying	CO-1
1.D	The interior of a refrigerator having inside dimensions of 0.5 m × 0.5 m base area and I m height, is to be maintained at 6°C, The refrigerator are constructed of two mild steel sheets 3mm thick (k = 46.5 W/m°C) with 50 mm of glass wool insulation (k = 0.046 W/m°C) between them. If the average heat transfer coefficients at the outer and inner surfaces are 11.6 W/m°C and 14.5 W/m°C respectively, calculare: (i) The rate at which heat must be removed from the interior to maintain the specified temperature in the kitchen at 25°C, and (ii) The temperature on the outer surface of the metal sheet.	**8**	Applying	CO-1
	Unit – II			
2.A	Derive an expression for critical thickness of insulation.	**4**	Understanding	CO-2
2.B	A 150 mm steam pipe has inside diameter of 120 mm and outside diameter of 160 mm. it is insulated at the outside with asbestos. The steam temperature is 150°C and the air temperature is 20°C. h (steam side) = 100 W/m^2°C, h (air side) = 30 W/m^2°C, k (asbestos) = 0.8 W/m°C and k (steel) = 42 W/m°C. How thick should the asbestos be provided in order to limit the heat loses to 2.1 kW/m^2.	**8**	Applying	CO-2
2.C	Derive the steady state heat conduction equation in cylindrical coordinator.	**8**	Understanding	CO-2
2.D	A uniform sheathing of plastic insulation (k = 0.18 W/m°C) is applied to an electric cable of 8mm diameter. The convective film coefficient on the surface of bare cable as well as insulated cable was estimated as 12.5 W/m^2°C and a surface temperature of 45°C was observed when the cable was directly exposed to ambient air 20°C. Determine: (i) The thickness of insulation to keep the wire as cool as possible. (ii) The surface temperature of insulated cable if the intensity of current flowing through the conductor remains unchanged.	**8**	Applying	CO-2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan – June 2019-20	Month- February
Sem- 6th	Subject- Power Plant Engineering	
Code - 337675(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 Steam rate, Heat rate, work ratio and super heater.	**4**	Understanding	CO3
1.B	Sketch The layout of modern Steam Power Plant and explain all circuit involved in it.	**8**	Understanding	CO1, CO3
1.C	A steam turbine plant operates on a theoretical reheat cycle. Steam at boiler at 150 bar and 550^0c expands at a constant pressure of 40 bar to 550^0c and expands through the low pressure turbine to a condenser at 0.1 bar Draw T-S and h-s plot. Find: i) Quality of steam at turbine exhaust. ii) Cycle efficiency. iii)Steam rate in Kg/Kwh	**8**	Applying	CO3
1.D	Write Short Note on : 1.Mechanical ash handling system 2. Hydraulic ash handling system	**8**	Remember	CO4
	Unit – II			
2.A	Describe main components of electrical distribution system	**4**	Remember	CO2
2.B	Explain coal handling system with neat sketch.	**8**	Remember	CO4
2.C	Explain working principle and types of air preheater with neat sketch.	**8**	Understanding	CO4
2.D	Describe Primary and secondary power distribution system.	**8**	Remembering	CO2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan. to June 2020	Month - February
Sem- 6th	Subject – Energy Systems	
Code – 337652 (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			
A	Explain the basic principle of jet propulsion.	4	Remember	CO1
B	An aircraft flies at 960 Kmph. One of its turbojet engines takes in 40 kg/sec. of air and expands the gases to ambient pressure. The air fuel ratio is 50 and lower calorific value of the fuel is 43MJ/kg . For the maximum thrust power determine –(i) Jet velocity(ii) Thrust (iii) Specific thrust (iv) Thrust power	8	Apply	CO1
C	Explain - (i) Afterburning in turbojet engine (ii)Thermodynamics of Turbojet Engine (iii) efficiency of turbojet	8	Understand	CO1
D	Briefly explain the Turbojet engine. Write its advantages and disadvantages.	8	Understand	CO1
	Unit – II			
A	What do you mean by Thrust Augmentation?	4	Understand	CO1
B	Briefly explain the Pulsejet engine. Write its advantages and disadvantages.	8	Understand	CO1
C	In a jet propulsion unit, air is drawn at the rate of 40 kg's from the surrounding at 1 bar, 17°C by the compressor and compresses it up to a pressure of 30 bar. The combustion process occurs at constant pressure and raises its temperature up to 927 °C. The gases then expand in the turbine up to a pressure of 1.5 bar and further expansions occur in the nozzle up to a pressure of 1.01 bar having its exit diameter of 30 cm. Calculate the thrust developed. (Assuming isentropic efficiency of compressor and turbine to be 0.85 and 0.88 respectively and neglect mass of fuel. Take C_p= 1.005 kJ/kgk γ= 1.4	8	Apply	CO1
D	Draw the schematic of Ramjet engine. Briefly write different operations.	8	Understand	CO1

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DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan – June 2020	Month- February
Sem- 6th	Subject- I.C. ENGINE	
Code - 337653 (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	Compare S.I. & C.I. engines at following points: i) Basic cycle ii) Fuel used iii) Induction of fuel iv) Ignition v) Speed	**4**	Understanding	CO1
1.B	Describe with suitable sketch, the construction and working of two stroke cycle SI engine, also draw the diagram and mark opening and closing of ports on it.	**8**	Understanding	CO1
1.C	What is meant by "burning time loss"? Discuss the effect of spark advance on the efficiency of otto cycle engine with the help of P-V diagram. What is optimum spark advance?	**8**	Understanding	CO2
1.D	How do the specific heats vary with temperature? What is the physical explanation for this variation? Explain with the help of p-V diagram.	**8**	Applying	CO2
	Unit – II			
2.A	Briefly explain: i) Indicated power ii) Volumetric efficiency	**4**	Understanding	CO1
2.B	What is meant by abnormal combustion in S.I. engine? Explain the phenomena of knock in S.I. engine.	**8**	Understanding	CO2
2.C	Explain the reasons why actual valve timing diagram is deviated from theoretical valve timing.	**8**	Applying	CO1
2.D	Explain the factors influencing flame speed.	**8**	Applying	CO1

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DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- Jan – June 2020	Month- February
Sem- 6th	Subject- PRODUCTION MANAGEMENT	
Code - 337655 (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	Explain the objectives of production management.	4	Understanding	CO1
1.B	Explain function & scope of production management.	8	Understanding	CO1
1.C	Explain product life cycle with neat sketch.	8	Understanding	CO1
1.D	What are the steps involved in new product design.	8	Applying	CO1
	Unit – II			
2.A	What are the advantages of batch production	4	Understanding	CO1
2.B	A factory producing only one item, which it sells for Rs 12.50 per unit has a fixed cost equal to Rs. 60000 & variable cost Rs. 7.5 per unit. Find: i) The number of units to be produced to break even ii) Number of units to be produced to earn profit of Rs. 12000 iii) The profit, if 25000 units are produced & sold.	8	Understanding	CO1
2.C	A company producing a single article sells it at Rs 10 each. The variable cost of production is Rs 6 each & fixed cost is Rs 400 per annum. Find: i) Sales at break-even point. ii) New BEP, if sales price is reduced by 10%.	8	Applying	CO1
2.D	Explain break even analysis & elements of cost.	8	Applying	CO1

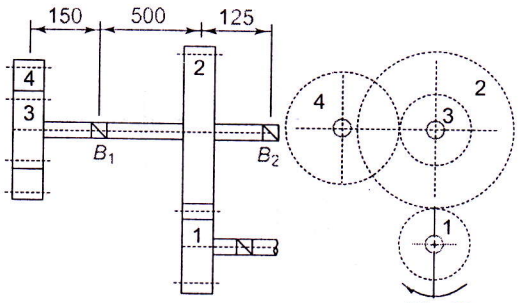
SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- Jan – June 2020	Month- February
Sem- 6th	Subject- Machine Design -II	
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	What is the objective of nipping of leaf spring?	**4**	Understanding	CO1
1.B	A railway wagon moving at a velocity of 2 m/s is brought to rest by a bumper consisting of two helical compression springs arranged in parallel. The springs are compressed by 150 mm in bringing the wagon to rest. The mass of the wagon is 1000 kg. The spring index can be taken as 6. The springs are made of oil-hardened and tempered steel wire with ultimate tensile strength of 1500 N/mm2 and modulus of rigidity of 81 370 N/mm2. The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the springs and calculate: (i) maximum force on each spring; (ii) wire diameter; (iii) mean coil diameter; and (iv) Number of active coils.	**8**	Applying	CO1
1.C	A helical compression spring of a mechanism is subjected to an initial pre-load of 50 N and the maximum force during the load cycle is 300 N. The wire diameter is 5 mm, while the spring index is 5. The spring is made of oil- hardened and tempered steel wire of Grade- SW (S_{ut}= 1440 N/mm2). Determine the factor of safety against fluctuating stresses	**8**	Applying	CO1
1.D	A semi-elliptic leaf spring consists of two extra full-length leaves and eight graduated- length leaves, including the master leaf. The centre-to-centre distance between the two eyes of the spring is 1 m. The maximum force acting on the spring is 10 kN and the width of each leaf is 50 mm. The spring is initially pre-loaded in such a way that when the load is maximum, the stresses induced in all the leaves are equal to 350 N/mm2. The modulus of elasticity of the leaf material is 207 000 N/mm2. Determine (i) the thickness of leaves; and (ii) the deflection of the spring at maximum load.	**8**	Applying	CO1

	Unit – II			
2.A	Why is the pinion weaker than the gear made of same material?	**4**	Understanding	CO2
2.B	A train of spur gears with 20° full-depth involute teeth is shown in Fig. 2B. Gear 1 is the driving gear and transmits 50 kW power at 300 rpm to the gear train. The number teeth on gears1, 2, 3and4are30, 60,25and50respectively, while the module for all gears is 8 mm. Gears 2 and 3 are mounted on the same shaft. Gear 1is rotating in the clockwise direction when seen from the left side of the page. Calculate (i) tangential and radial components of tooth forces between gears 1 and 2 and gears 3 and 4; and (ii) resultant reactions at bearing B_1 and B_2  Fig.2B	**8**	Applying	CO2
2.C	The following data is given for a pair of spur gears with 20° full-depth involute teeth: number of teeth on pinion = 24 number of teeth on gear = 56 speed of pinion = 1200 rpm module = 3 mm service factor = 1.5 face width = 30 mm Both gears are made of steel with an ultimate tensile strength of. 600 N/mm^2. Using the velocity factor to account for the dynamic load, calculate (i) beam strength; (ii) velocity factor; and (iii) rated power that the gears can transmit without bending failure, if the factor of safety is 1.5.	**8**	Applying	CO2
2.D	A pair of spur gears with 20° pressure angle, consists of a 25 teeth pinion meshing with a 60 teeth gear. The module is 5 mm, while the face width is 45 mm. The pinion rotates at 500rpm.Thegearsaremadeofsteelandheat treated to a surface hardness of 220 BHN. Assume that dynamic load is accounted by means of the velocity factor. The service factor and the factor of safety are 1.75 and 2respectively.Calculate (i) wear strength of gears; (ii) the static load that the gears can transmit without pitting; and (iii) rated power that can be transmitted by gears.	**8**	Applying	CO2