SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test: I	Session: July-January 2022	Month: December
Sem- 5th Sem	Subject: ICE	
Code – C037511(037)	Time Allowed: 2 hrs	Max Marks: 40

Note: - Attempt all question. Parts (a) are compulsory of each question. Solve any two parts from (b), (c) and (d) of each question.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	What is the normal range of compression ratio for S.I. and C.I. engine?	4	Remembering	CO1
1.B	Draw the valve timing diagram of 4 stroke petrol (both low & high speeds) and explain the reason why the opening and closing of inlet & exhaust valves are not at dead centers?	8	Creating	CO2
1.C	Explain the working of four stroke diesel engine. Discuss its merits and demerits?	8	Apply	CO1
1.D	The compression ratio of an engine working on otto cycle is 6 and A/F ratio is 15:1. The Calorific value of the fuel is 44 Mj/kg. The pressure and temp at the beginning of compression is 1 bar and 60°C. Determine the maximum pressure in cycle if compression follows the law $PV^{1.3} = C$ And $C_v = (0.71+20 \times 10^{-5} T)$ KJ /kg K where T is in °K. What would be the maximum pressure if C_r is constant?	8	Analyzing	CO2
	Unit – II			
2.A	What do you mean by detonation and knocking?	4	Analyzing	CO2
2.B	Explain the stages of combustion in SI engines and the effect of various engine variables on all the stages in details?	8	Apply	CO1
2.C	Explain the stages of combustion in CI engines and the effect of various engine variables on all the stages in details?	8	Apply	CO3
2.D	What is the basic requirement of I.C. Engine fuels? Explain pre-ignition, antiknock rating of fuels, octane number?	8	Creating	CO2

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- 2022-23	Month- September
Sem- 5th	Subject- Fluid Machines	
Code :- C037512(037)	Time Allowed: 2hr.	Max Marks: 40

Note: - 1.first Question (A) from both unit are compulsory.
2. Solve any two from B,C,D of each unit.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	Define followings: i. Boundary layer. ii. Momentum Thickness. iii. Bluff body. iv. Boundary layer separation.	**4**	Remembering	1
1.B	A plate of 600 mm length and 400 mm wide is immersed in a fluid of sp. gr. 0.9 and kinematic viscosity $10^{-4}\ \frac{m^2}{s}$. The fluid is moving with a velocity of 6 m/s. Determine (i) boundary layer thickness, (ii) shear stress at the end of the plate, and (iii) drag force on one side of the plate.	**8**	Understanding	1
1.C	For the velocity profile for laminar boundary layer flows given as $\frac{u}{U_\infty} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$ Find an expression for boundary layer thickness(δ), shear stress (τ_0),coefficient of drag C_D and drag force in terms of Reynolds no.	**8**	Analyzing	1
1.D	A jet plane having a wing area of 20 m^2 and weighing 25 kN flies at 950 km/hr speed. The engine develops 8500 kW and has a mechanical efficiency of 60 percent. Determine the lift and drag coefficients for the wind. Take specific weight of air = 12 N/m^3.	**8**	Applying	1
	Unit – II			
2.A	Explain impulse moment principle.	**4**	Remembering	2
2.B	Derive an expression of Work done per second per unit weight of the fluid striking per second for the case of unsymmetric moving curve vane when the jet striking tangentially at one tip.	**8**	Analyzing	2
2.C	A jet of water of diameter 7.5 cm strikes a curved plate at its center with a velocity of 20 m/s. The curved plate is moving with a velocity of 8 m/s in the direction of the jet. The jet is deflected through an angle of 165^0. Assuming the plate smooth find: (i) Force exerted on the plate in the direction of the jet.	**8**	Applying	2

	(ii) Power of the jet. (iii) Efficiency of the jet.			
2.D	A jet of water having a velocity of 15 m/s strikes a curved vane which is moving with a velocity of 5 m/s. The vane is symmetrical and is so shaped that the jet is deflected through 120°. Find the angle of the jet at inlet of the vane so that there is no shock. What is the absolute velocity of the jet at outlet in magnitude and direction and the work done per unit weight of water. Assume the vane to be smooth.	8	Ap	2

22/12/22
S-II

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test: I	Session: July-January 2022	Month: December
Sem- 5th Sem	Subject: Solid Mechanics	
Code – C037512(037)	Time Allowed: 2 hrs	Max Marks: 40

Note: - Attempt all question. Parts (a) are compulsory of each question. Solve any two parts from (b), (c) and (d) of each question.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	Define strain energy, resilience, proof resilience and modulus of resilience.	**4**	Remembering	CO1
1.B	A steel specimen 1.5 cm^2 in cross-section stretches 0.05 mm over 5 cm gauge length under an axial load of 30 kN. Calculate the strain energy stored in the specimen at this point. If the load at the elastic limit for specimen is 50 kN, calculate the elongation at the elastic limit and the resilience.	**8**	Creating	CO2
1.C	Using Castigliano's theorem calculate the vertical deflection at the middle of a simply supported beam which carries an UDL of intensity w over full span. The flexural rigidity EI is constant and only strain energy of bending is to be considered.	**8**	Apply	CO1
1.D	Derive and analyse Maxwell's reciprocal deflection theorem.	**8**	Analyzing	CO2
	Unit – II			
2.A	Analyze the stresses working on pressure vessel and define the pressure vessel or shell.	**4**	Analyzing	CO2
2.B	What assumptions are taken in the analysis of thin cylinders? Deduce expressions for circumferential and hoop stresses. Also find change in length, diameter and volume of cylinder due to internal pressure.	**8**	Apply	CO1
2.C	A cylindrical shell 2.5 long which is closed at the ends has internal diameter 250 mm and wall thickness 7.5 mm. Determine: (i) circumferential and longitudinal stresses induced in the shell material (ii) change in length, diameter of the shell if it is to an internal pressure of 1.5 MN/m^2. The cylinder is built up with riveted joints and the efficiencies of the longitudinal and circumferential joints are 85% and 60% respectively. Take modulus of elasticity E = 200 GPa and Poisson's ratio u =0.3.	**8**	Apply	CO3

2.D	A thick cylinder has inner and outer diameters as 120 mm and 180 mm respectively. It is subjected to an external pressure of 9 MPa. Find the value of Internal pressure which can be applied if the maximum stress is not to exceed 30 MPa. Draw the curves showing the variation of hoop and radial stresses through the material of the cylinder.	8	Creating	CO2

23/12/22

S-I

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- July -Dec 2022	Month- December
Sem- 5th	Subject- Operation Research	
Code – C037531(037)	Time Allowed: 2 hrs	Max Marks: 40

Note: - Question 1 (A) is Compulsory. Attempt any One question from part B and C, which carries 16 marks.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	Write the scope of operation research.	4	Understanding	CO1
1.B	Solve By Big-M Method Maximise $Z = 3X_1 - X_2$ Subjected to $2X_1 + X_2 \geq 2$ $X_1 + 3X_2 \leq 3$ $X_2 \leq 4$ $X_1, X_2, \geq 0$	**16**	Applying	CO1
1.C	Solve By Simplex Method Maximize $Z = 45X_1 + 80X_2$ Subjected to $5X_1 + 20X_2 \leq 400$ $10X_1 + 15X_2 \leq 450$ $X_1, X_2 \geq 0$	**16**	Applying	CO1
	Unit – II			
2.A	Analyze the assumption of transportation model. How it is special case L.P.P?	**4**	Analyzing	CO2
2.B	Solve the following assignment Problem *I II III IV V* *1* 11 17 8 16 20 *2* 9 7 12 6 15 *3* 13 16 15 12 16 *4* 21 24 17 28 26 *5* 14 10 12 11 13	**16**	Applying	CO2
2.C	Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees. Solve by Vogel Approximate Method.	**16**	Applying	CO2

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	100 (Total)

23/12/22

8-II

SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Class Test: I	**Session: July-December, 2022**	**Month: December, 2022**
Semester 5th	**Subject: Dynamics of Machines**	
Code: C037514(037)	**Time Allowed: 2 Hours**	**Max Marks: 40**

Note: - Part A of Questions 1 and 2 is compulsory, from other parts B, C and D of Questions 1 and 2, attempt any two parts.
Ignore the columns of Level of Bloom's taxonomy and CO.

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Question – 1			
1.A	(i) Differentiate between Radius of Rotation and Radius of Governor in a Proell Governor (ii) Differentiate between Sensitivity and Hunting	4	Remember, Understand	1
1.B	The upper arms of a porter governor are pivoted on the axis of rotation, their lengths being 30cm. The lower arms are pivoted on the sleeve at a distance of 3cm from the axis, their lengths being 27cm. Mass of each ball is 6kg, and the sleeve mass is 50kg. Determine the equilibrium speed for a radius of rotation of 17cm, and also find the Effort and Power for 1% change of speed.	8	Apply	1
1.C	Following particulars refer to a Proell governor with open arms: Length of all arms=200mm, distance of pivot of arms from axis of rotation=40mm, length of extension of lower arms to which each ball is attached=100mm, mass of each ball=6kg, mass of central load=150kg. If radius of rotation of balls is 180mm when arms are inclined at an angle of 40^0 to the axis of rotation, find equilibrium speed.	8	Apply	1
1.D	Analyze the need for having different types of centrifugal governors.	8	Analyze	1

P.T.O

Question – 2				
2.A	Explain the condition of static and dynamic balancing of rotating masses.	4	Understand	2
2.B	A shaft carries four masses A, B, C and D of magnitude 200, 300, 400 and 200kg respectively revolving at radii 80, 70, 60 and 80mm in planes measured from A at 300, 400 and 700 mm. Angles between the cranks measured anticlockwise are A to B 45^0, B to C 70^0 and C to D 120^0. Balancing masses are to be placed in planes X and Y. Distance between planes A and X is 100mm, between X and Y is 400mm and between Y and D is 200mm. If balancing masses revolve at a radius of 100mm, find their magnitudes and angular positions.	8	Apply	2
2.C	Turning moment diagram for a four stroke gas engine may be assumed for simplicity to be represented by four triangles, area of which from line of zero pressure are: Suction Stroke=$0.45\times10^{-3}m^2$, Compression Stroke=$1.7\times10^{-3}m^2$, Expansion stroke=$6.8\times10^{-3}m^2$, Exhaust stroke=$0.65\times10^{-3}m^2$. Each m^2 of area represents 3MNm of energy. Assuming resisting torque to be uniform, find mass of rim of flywheel required to keep speed between 202rpm and 198 rpm. Mean radius of rim is 1.2m	8	Apply	5
2.D	Analyze the importance of flywheel and governor with respect to smooth functioning of an engine.	8	Analyze	5