SHRI SHANKARACHARYA INSTITUTE OF PROFESSIONAL MANAGEMENT AND TECHNOLOGY		
DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- July to December 2021	Month- October
Sem- 5	Subject- ICE	
Code - **C037511(037)**	Time Allowed: 2 hrs	Max Marks: 40
Note: -		

Q. No	Questions	Marks	Levels of Bloom's taxonomy	CO
	Unit – I			
1.A	What is meant by burning time loss? Explain with the help of (P-V) diagram?	**4**	Remembering	CO2
1.B	Draw a typical valve timing diagram of four stroke low speed and high speed CI engine and give the reasons for opening the valve before dead centre and closing the valves after dead centres?	**8**	Remembering	CO1
1.C	Explain the working of four stroke petrol engine. Discuss its merits and demerits?	**8**	Remembering	CO1
1.D	The air fuel ratio of a diesel engine is 29:1. If the compression ratio is 16:1 and the temperature at the end of compression is 900K, find at what percentage of stroke is the combustion completed. Assume that the combustion begins at the top dead centre and takes place at constant temperature. Take calorific value of fuel as 42000KJ/Kg, R= 0.287KJ/KgK and C_v= 0.709+0.000028TKJ/KgK?	**8**	Applying	CO2
	Unit – II			
2.A	Explain vapor lock, carburetor icing?	**4**	Remembering	CO3
2.B	Explain with suitable sketches the combustion phenomena in C.I engines and explain the four stages of combustion in C.I engines with the help of pressure crank angle (P-Θ) diagram	**8**	Remembering	CO3
2.C	Describe the phenomenon of detonation in S.I engine. What are the differences between detonation in S.I engine and knocking in C.I engine?	**8**	Remembering	CO4
2.D	A mixture of octane vapor (C_8H_{18}) and air suspended to a petrol engine. The measured amount of CO_2 is 13% by volume in the dry exhaust gases by volume. Assuming the combustion is complete, find out A: F ratio by volume and express this as a percentage of stoichiometric ratios.	**8**	Applying	CO3

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DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	Session- July to December 2021	Month- October
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. Drag force. iii. Stream line body. iv. Boundary layer separation.	**4**	R	1
1.B	Explain Boundary layer thickness, momentum thickness and derive an Expression for the Energy thickness.	**8**	U	1
1.C	A thin plate is moving in still atmospheric air at a velocity of 5m/s. The length of the plate is 0.6 m and width 0.5m. Calculate (i) the thickness of the boundary layer at the end of the plate and (ii) drag force on one side of the plate. Take density of air as 1.24kg/m3 and kinematic viscosity 0.15 stokes.	**8**	Ap	1
1.D	A kite weighing 12.26 N has an effective area of 0.9m2. The tension in the kite string is 32.37 N when the string makes an angle of $45^0$with the horizontal for a wind of 32 km/hour, what are the coefficient of lift and drag if the kite assumes an angle of 8^0 with the horizontal? Take specific weight of the air as 11.801 N/m3.	**8**	Ap	1
	Unit – II			
2.A	Explain impulse moment principle.	**4**	R	2
2.B	Draw the velocity diagram for Pelton wheel and prove that $\eta_{h\,max} = \frac{[1+cos\phi]}{2}$. For maximum Hydraulic efficiency.	**8**	U	2
2.C	A jet of water of diameter 50mm, having a velocity of 20m/s strike a curved vane which is moving with a velocity of 10m/s in the direction of jet. The jet leaves the vane at an angle of $60^0$to the direction of motion of vane at outlet Determine: (i) The force exerted by the jet on the vane in the direction of motion. (ii) Work done per second by the jet.	**8**	Ap	2
2.D	A Pelton wheel develops 8000KW under a head of 130m at a speed of 200 r.p.m. assuming the coefficient of velocity for the nozzle 0.98, hydraulic efficiency = 87%, speed ratio 0.46 and jet diameter to wheel diameter ratio 1/9, determine. The discharge required. (i) The diameter of the wheel. (ii) The diameter and number of jet required. If mechanical efficiency is 75%.	**8**	Ap	3

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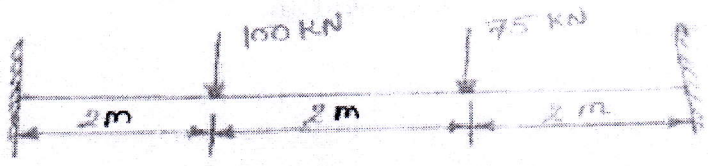
DEPARTMENT OF MECHANICAL ENGINEERING

Class Test: I	Session: July-January 2021	Month: October
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	Write the expressions for strain energy, proof resilience and modulus of resilience in a member under tension and compression.	**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	State and prove Castigliano's theorem.	**8**	Understanding	CO1
1.D	Using castigliano's theorem determines the deflection at the centre of the simply supported beam 3 m span carries a uniformly distributed load of 20 kN/m. Take EI=2.25 MNm^2.	**8**	Analyzing	CO2
	Unit – II			
2.A	What are the merits and demerits of a fixed beam over simply supported beam?	**4**	Remembering	CO2
2.B	A beam has its ends fixed horizontally at the same level. The beam is of length 'l' and carries a load *w* at a distance '*a*' from one end and 'b' from the other end. Determine the fixing moments at the ends.	**8**	Analyzing	CO1
2.C	State and prove that Maxwell's reciprocal deflection theorem.	**8**	Understanding	CO3
2.D	A fixed beam of 6 m span carries point loads of 100 kN and 75 kN as shown in figure. Find (i) Fixing moments at the ends, (ii) Reactions at the supports. Draw the B.M. and S.F. diagram. 	**8**	Creating	CO2

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DEPARTMENT OF MECHANICAL ENGINEERING		
Class Test – I	Session- July – Dec, 2021	Month-October
Sem- 5th	Subject- OPERATIONS RESEARCH	
Code - C037531(037)	Time Allowed: 2 hrs	Max Marks: 40

Note – Question 1 (A) & 2 (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	Write the application of operation research in industry.	4	Remember	CO1
2	A small manufacturer employs 5 skilled men and 10 semi-skilled men and makes an article in two qualities, deluxe model and an ordinary model. The making of a deluxe model requires 2 hours work by a skilled man and 2 hours work by semi-skilled man. The ordinary model requires 1 hours work by a skilled man and 3 hours work by semi-skilled man. By union rules no man can work more than 8 hours per day. The manufacturer's clear profit of the deluxe model is Rs. 10 and of the ordinary model Rs. 8. Formulate the model of the problem and solve by graphical method.	16	Apply	CO1
3	Solve By Simplex Method Maximise $Z = 3X_1 + 5X_2 + 4X_3$ Subjected to $2X_1 + 3X_2 \leq 8$ $3X_1 + 2X_2 + 4X_3 \leq 15$ $2X_2 + 5X_3 \leq 10$ X_1, X_2, and X_3 all ≥ 0	16	Apply	CO1

P.T.O.

Unit– II

1	Find the initial basic feasible solution by north-west corner rule and also find the corresponding cost. To / From / Available / Demand 3 4 6 8 9 — 20 2 10 1 5 8 — 30 7 11 20 40 3 — 15 2 1 9 14 16 — 13 Demand: 40 6 8 18 6	4	Apply	CO2
2	Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees. Solve by Vogel Approximate Method. 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)	16	Apply	CO2
3	Solve the following Transportation problem (MODI Method) and obtained the optimum solution.	16	Apply	CO2

	D1	D2	D3	D4	Supply
O1	2	2	2	1	3
O2	10	8	5	4	7
O3	7	6	6	8	5
Demand	4	3	4	4	

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DEPARTMENT OF MECHANICAL ENGINEERING

Class Test – I	**Session- July-December, 2021**	**Month- October, 2021**
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	**Explain the working of a Centrifugal Governor with suitable diagram.**	4	R	1
1.B	**In a Porter Governor, the arms and links are each 25cm long and intersect on the main axis. Each ball weighs 4.5kg and central load is 20kg. Sleeve is in the lowest position when arms are inclined at 30^0 to the vertical. The lift of the sleeve is 5cm. What is the force of friction at the sleeve if speed at ascent from lowest position is equal to the speed at beginning of descent from the highest position? What is then the range of speed of governor?**	8	U	1
1.C	**The mass of each ball of a Proell governor is 7.5kg and load on the sleeve is 80kg. Each of the arms is 300mm long. The upper arms are pivoted on the axis of rotation and lower arms are pivoted to links 40mm from the axis of rotation. The extensions of lower arms to which balls are attached are 100mm long and parallel to governor axis at the minimum radius. Determine the equilibrium speeds corresponding to extreme radii of 180mm and 240mm.**	8	U	1
1.D	**In a spring loaded governor of Hartnell type, mass of each ball is 5kg and lift of sleeve is 50mm. Speed at which governor begins to float is 240rpm, and at this speed the radius of ball path is 110mm. The mean working speed of governor is 20 times the range of speed, when friction is neglected. If lengths of ball and roller arms are 120mm and 100mm respectively, and if distance between center of pivot of bell crank lever and axis of governor spindle is 140mm, find initial compression of spring, taking into account obliquity of arms.**	8	U	1

P.T.O.

Question – 2				
2.A	Define Balancing of rotating masses and explain the need for balancing of rotating masses.	4	R	2
2.B	(i) Define Sensitiveness of governor (ii) Define Stability of governors (iii) What is isochronous governor? (iv) Explain Hunting in Governors	8	U	1
2.C	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 form 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	A	2
2.D	Explain the condition of static and dynamic balancing of rotating masses in detail with suitable diagrams.	8	U	2