Hall Ticket Number :										

R-17

Code: 7G552

III B.Tech. I Semester Regular & Supplementary Examinations February 2021

Applied Thermodynamics-II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Comment the efficiency of the Rankine cycle with respect to Carnot cycle. Also obtain the expression for efficiency of Rankine cycle.	7M	CO1	L3
	b)	A basic steam power plant works on ideal Rankine cycle between 30 bar and 0.04 bar. The initial condition of steam being 0.8 dry and flow rate 10kg/s determine (i) Work required for pumping (ii) work done by the turbine (iii) cycle efficiency.	7M	CO1	L3
		OR			
2.	a)	Draw T-S and H-S diagram of reheat Rankine cycle with the help of circuit diagram and derive its efficiency.	7M	CO1	L3
	b)	In a Rankine cycle, the steam at inlet to turbine is dry saturated at a pressure of 35bar and the exhaust pressure is 0.2 bar. Calculate pump work, turbine work, Rankine efficiency and condenser heat flow. Assume flow rate of steam as 9.5kg/s.	7M	CO1	L3
		UNIT–II			
3.	a)	Differentiate between water tube and fire tube boilers.	7M	CO2	L2
	b)	Discuss the working of Babcock and Wilcox boiler with a neat sketch.	7M	CO2	L2
		OR			
4.	a)	Derive the expression for the draught produced in terms of water column.	7M	CO2	L3
	b)	A boiler working at a pressure of 20 bar evaporates 10 kg of water per kg of coal fired from feed water entering at 40^0C. The steam at the inlet of the stop valve is 0.9 dry. Determine the equivalent evaporation from and at 100^0C.	7M	CO2	L3
		UNIT–III			
5.	a)	Explain the supersaturated flow of steam through a nozzle and the significance of Wilson's line.	7M	CO3	L2
	b)	Steam enters a group of nozzles of a steam turbine at 12 bar and 220^0C and leaves at 1.2 bar. The steam turbine develops 220KW with a specific steam consumption of 13.5 kg/KWh. If the diameter of nozzles at throat is 7mm, calculate the number of nozzles.	7M	CO3	L3
		OR			
6.	a)	Derive an expression for the condition for maximum discharge through a nozzle.	7M	CO3	L3
	b)	Dry saturated steam at 10 bar is expanded isentropically in a nozzle to 0.1 bar. Using steam tables only, find the dryness fraction of the steam at exit. Also find the velocity of steam leaving the nozzle when initial velocity is negligible.	7M	CO3	L3

UNIT–IV

7.	a)	What are various sources of air leakage in to steam condenser? How does it affect the performance of condensing plant?	7M	CO4	L3
	b)	Describe with neat sketch the working of surface condenser.	7M	CO4	L2
		OR			
8.	a)	Explain the construction and working of, Edward's air pump.	7M	CO4	L2
	b)	A surface condenser is designed to handle 10,000 kg of steam per hour. The steam enters at 0.08 bar and 0.9 dryness and the condenser leaves at the corresponding saturation temperature, the pressure is constant throughout the condenser. Estimate cooling water flow rate per hour if cooling water temperature is limited to 100°C.	7M	CO4	L3

UNIT–V

9.	a)	What is 50% Reaction Turbine?	4M	CO5	L2
	b)	Reaction Turbine runs at 3000rpm and its steam consumption is 15400kg/hr. the pressure of steam at a certain pair is 1.9 bar its dryness 0.93 and power developed by air is 3.5 kW. The discharging blade tip angle is 200 for both fixed and moving blades and the axial velocity of flow is 0.72 of the blade velocity. Find the drum diameter and blade height. Take the tip leakage steam as 8%, but neglect blade thickness.	10M	CO5	L3
		OR			
10.	a)	Show by graphical representation of pressure and velocity of a steam in impulse turbine.	5M	CO5	L2
	b)	In a De-Lavel turbine, the steam enters the wheel through a nozzle with a velocity of 500 m/s and at an angle of 20° to the direction of motion of the blade. The blade speed is 200 m/s and the exit angle of the moving blade is 25°. Find the inlet angle of moving blade, exit velocity of steam and its direction and work done per kg of steam.	9M	CO5	L3

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Hall Ticket Number :										

R-17

Code: 7G555

III B.Tech. I Semester Regular & Supplementary Examinations February 2021

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Discuss, What are the factors to be considered for the selection of materials for the design of machine elements?	7M	CO1	L2
	b)	Discuss the BIS method of designation of steels with an example.	7M	CO1	L2
		OR			
2.	a)	What are preferred numbers? Find out the numbers of R5 basic series from 1 to 10.	7M	CO1	L1,L2
	b)	A shaft, as shown in Fig.1, is subjected to a bending load of 3 kN, pure torque of 1000 N-m and an axial pulling force of 15 kN. Calculate the stresses at A and B.			

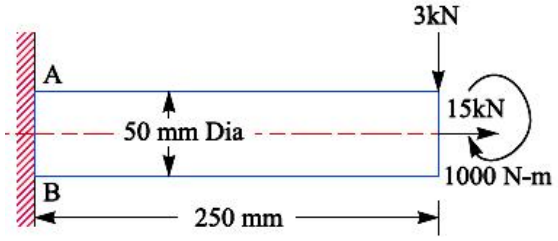
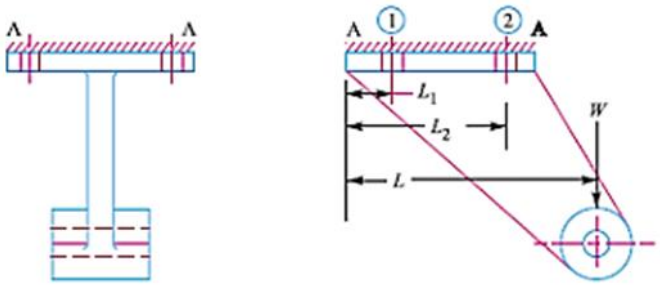


Fig.1 7M CO1 L6

		UNIT–II			
3.	a)	What is stress concentration factor? What are the methods of reducing stress concentration?	7M	CO2	L1,L2
	b)	A forged steel bar of 50mm in diameter is subjected to a reversed bending stress of 250 N/mm^2. The bar is made up of steel 40C8 (Sut = 600 N/mm^2). Calculate the life of bar for a reliability of 90%. Assume Ka = 0.44, Kb = 0.85.	7M	CO2	L6
		OR			
4.	a)	What is endurance limit? What are the factors that affect the endurance limit of a machine part?	4M	CO2	L1,L2
	b)	A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to 4 P. The span of the beam is 500 mm and its cross-section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500 MPa, endurance limit of 330 MPa for reversed bending, and a factor of safety of 1.3, calculate the maximum value of P. Take a size factor of 0.85 and a surface finish factor of 0.9	10M	CO2	L6

UNIT–III

5. A bracket, as shown in figure below, supports a load of 30 kN. Determine the size of bolts, if the maximum allowable tensile stress in the bolt material is 60 MPa. The distances are: L1 = 80 mm, L2 = 250 mm and L = 500 mm.



14M CO3 L2

OR

6. a) What are the advantages and disadvantages of welded joints? 4M CO3 L1, L2

b) A welded connection, as shown in Fig.3 is subjected to an eccentric force of 7.5 kN. Determine the size of the welds if the permissible shear stress for the weld is 100 N/mm^2. Assume static conditions.

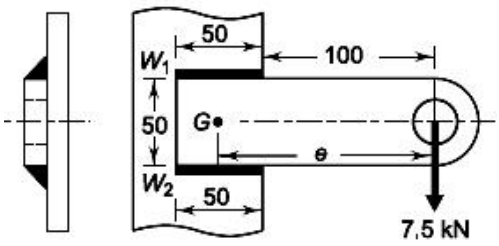


Fig.3 10M CO3 L6

UNIT–IV

7. a) What is a knuckle joint? Give practical examples of knuckle joint. 4M CO4 L1,L2

b) Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa. 10M CO4 L6

OR

8. Design and draw a cotter joint to support a load varying from 30 kN in Compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa; shear stress = 35 MPa and crushing stress= 90 MPa. 14M CO4 L6

UNIT–V

9. a) What are the different criteria of designing a shaft? 4M CO5 L1,L2

b) Find the diameter of a solid shaft to transmit 25 kW at 300 rpm. Take the maximum allowable shear stress as 50 N/mm^2. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameter is 0.6. 10M CO5 L6

OR

10. Design a cast iron protective flange coupling to connect two shafts in order to transmit 7.5 kW at 720 r.p.m. The following permissible stresses may be used: Permissible shear stress for shaft, bolt and key material = 33 MPa; Permissible crushing stress for bolt and key material = 60 MPa; Permissible shear stress for the cast iron = 15 MPa 14M CO5 L6

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Hall Ticket Number :										

R-17

Code: 7G553

III B.Tech. I Semester Regular & Supplementary Examinations February 2021

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Deduce an expression for the effort required to raise a body of weight W on an inclined plane with usual notations.	7M	CO1	L2,L3
	b)	A body on a rough horizontal surface requires a force of 240 N inclined at 25^0 just to pull it and 280 N just to push it at the same angle. Determine the weight of the body and the coefficient of friction.	7M	CO1	L2,L3
		OR			
2.	a)	Describe with neat sketch the working principle of cone clutch.	7M	CO1	L2,L3
	b)	A single plate clutch with both sides of the plate effective, is lined with asbestos having coefficient of friction of 0.3. The allowable pressure on fiction lining is 0.18 MPa. The inside and outside diameters of the friction lining are 90 mm and 300 mm respectively. Assuming uniform pressure, find the safe power that can be transmitted by this clutch at 300 rpm.	7M	CO1	L2,L3
		UNIT–II			
3.		A simple band brake of drum diameter 600 mm has a band passing over it with an angle of contact of 210^0. While one end of band is connected to the lever fulcrum, the other end is connected to the lever at a distance of 400 mm from fulcrum and this end is perpendicular to the lever. The brake lever is 1000 mm long. Coefficient of friction is 0.33. Find the effort required at the end of lever to stop the rotation of the drum. The drum absorbs 15 kW at 720 rpm.	14M	CO2	L3,L4
		OR			
4.	a)	With neat sketch discuss the effect of gyroscopic couple on aero-planes.	5M	CO2	L2
	b)	A ship engine is propelled by a rotor of mass 5000 kg and a radius of gyration of 0.5 m. The rotor rotates at 2100 rpm clockwise when viewed from the stern. Find the gyroscopic couple for the following conditions: i) The ship steers at a speed of 18 kmph to the left around a curve of 90 m radius. ii) The ship rolls with an angular velocity of 0.05 rad /sec clockwise when viewed from stern, at a particular instant.	9M	CO2	L3,L4, & L5
		UNIT–III			
5.		A single cylinder, four stroke I C engine develops 12 kW at 600 rpm. The work done by the gases during expansion stroke is 3 times the work done by the gases during compression stroke. The work done by the other two strokes is negligible. The total fluctuating of speed is limited to 3 % of the mean speed. The work done during suction and expansion strokes may be assumed to be triangular in shape. Find the mass of the fly wheel taking its radius of gyration as 0.5 m	14M	CO3	L3,L4
		OR			

6.	a)	What do you understand by terms: i) Sensitiveness ii) Hunting and iii) Isochronism	3M	CO3	L2
	B)	The arms of a porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of central sleeve is 30 kg. The radius of rotation of the governor balls is 150 mm when sleeve begins to rise and reaches a value of 200 mm at maximum speed. Determine the speed range of the governor.	11M	CO3	L2, L3 & L4

UNIT–IV

7.		A rotating shaft carries 4 masses A, B, C and D at radii 100, 125, 200 and 150 mm respectively. The planes in which these masses revolve are spaced at 600 mm apart. The masses at B, C and D are 10, 5 and 4 kg respectively. Find the required mass at A and the angular positions of 4 masses to keep the shaft in balance.	14M	CO4	L2. L3 & L4

OR

8.		The crank and connecting rod of a 4 cylinder in line engine running at 1800 rpm, are 50 mm and 250 mm respectively and the cylinders are placed at 150 mm apart. If the cylinders are numbered 1 to 4 in sequence from one end, then the cranks appear at intervals of 90^0 in the end view in the order 1 – 4 – 2 - 3. The reciprocating masses corresponding to each cylinder are 1.5 kg. Determine: i) Unbalanced primary and secondary forces if any and ii) Unbalanced primary couples with reference to central plane of engine.	14M	CO4	L2. L3 & L4

UNIT–V

9.	a)	A steel shaft 25 mm diameter, 1.5 m long carries a disc of mass 5 kg at its center and another mass of 2 kg at 0.5 m from left support. Find the whirling speed if E = 200 GPa.	6M	CO5	L3,L4
	b)	A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100kg at its free end. The Young's modulus for the shaft material is $200GN/m^2$. Determine the frequency of longitudinal and transverse vibrations of the shaft	8M	CO5	L2,L3 & L4

OR

10.	a)	Deduce the expressions for natural frequency of vibration of a spring mass system without considering the mass of spring and with considering mass of the spring.	14M	CO5	L2,L3 & L4

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Hall Ticket Number :										

R-17

Code: 7G556

III B.Tech. I Semester Regular & Supplementary Examinations February 2021

Engineering Metrology

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.		Infer type of fit of $55H_7f_8$, Use range of diameter 50-65, i=0.45$\sqrt[3]{D}$+0.001D, IT07=16i, IT08=25i and fundamental deviation for h-shaft [-5.5$D^{0.41}$]	14M	CO1	4
		OR			
2.	a)	Discuss about i) Maximum Metal Limits ii) Minimum Metal Limits	8M	CO1	2
	b)	Classify Non-dimensional gauges based on type and purpose, Explain the interference fit.	6M	CO1	4
		UNIT–II			
3.	a)	Describe the method of using sine bar for measuring taper angle of plug gauges.	7M	CO2	2
	b)	Explain the principle of Autocollimator with neat sketch	7M	CO2	1
		OR			
4.		Illustrate NPL flatness interferometer.	14M	CO2	4
		UNIT–III			
5.		List types of surface roughness measurement methods and discuss any one method with neat sketch and its industrial application.	14M	CO3	1
		OR			
6.	a)	Evaluate surface for CLA and RMS value using the measurement from a datum given below in microns over a length of 20 mm.			

35	25	40	22	35	18	42	25	30	21
36	18	42	25	30	21	35	18	25	28

			7M	CO3	5
	b)	Show the IS:3073 of 1967 – to characteristics of surface texture.	7M	CO3	3
		UNIT–IV			
7.		Recommend and discuss a suitable method of inspection of profile screw thread with neat sketch.	14M	CO4	4
		OR			
8.		Explain the principle of pneumatic comparator using a diagram.	14M	CO4	2
		UNIT–V			
9.	a)	Discuss assignable and non-assignable causes.	7M	CO5	2
	b)	Generate data to use a double sampling plan.	7M	CO5	6
		OR			
10.		Assess the importance of Coordinating Measuring Machines in industry, List type of CMMs.	14M	CO5	5

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Hall Ticket Number :										

R-17

Code: 7G551

III B.Tech. I Semester Regular & Supplementary Examinations February 2021

Industrial Management

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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		Marks	CO	Blooms Level
	UNIT–I			
1.	Enumerate the concepts and functions of Management and organization	14M	CO1	L1
	OR			
2.	Explain the basic concepts related to Departmentation and Decentralization	14M	CO1	L1
	UNIT–II			
3.	Describe the objectives of plant layout. Explain the types of Plant layout.	14M	CO2	L1
	OR			
4.	Explain in detail about the programme evaluation review techniques.	14M	CO2	L1
	UNIT–III			
5.	Define the term Work study. Explain in detail the objectives of Work study.	14M	CO3	L1
	OR			
6.	Describe the various methods involved for Performance rating in Work study.	14M	CO3	L1
	UNIT–IV			
7.	Explain in detail about Inventory classification techniques.	14M	CO4	L1
	OR			
8.	Explain the concepts of Marketing Mix and Product life cycle.	14M	CO4	L1
	UNIT–V			
9.	Describe the different methods of evaluation methods in Human resource management	14M	CO5	L1
	OR			
10.	Explain the various types of Wage incentive schemes.	14M	CO5	L1

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Hall Ticket Number :										

R-17

Code: 7G554

III B.Tech. I Semester Regular & Supplementary Examinations February 2021

Machine Tools

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Show schematically Merchant's force circle in orthogonal cutting and explain in detail about the each forces encountered in the force circle.	7M	CO1	L1
	b)	Describe important desirable properties of a cutting tool.	7M	CO1	L2
		OR			
2.	a)	What are throw away carbide tips? What are their advantages and basic requirements?	7M	CO1	L1
	b)	List various types of chip breakers and explore their significance.	7M	CO1	L1
		UNIT–I			
3.	a)	With a neat diagram sketch an engine lathe, mark it's parts and describe them briefly.	7M	CO2	L4
	b)	What are the significant features of a turret lathe as compared to an engine lathe?	7M	CO2	L1
		OR			
4.	a)	Why are engine lathes called by that name? List various specifications of lathe.	7M	CO2	L2
	b)	Name any four operations which can be performed on a lathe and explain them briefly.	7M	CO2	L1
		UNIT–I			
5.	a)	Explain the working of a hydraulic quick return mechanism of a shaper.	7M	CO3	L2
	b)	List various operations performed on a Planner.	7M	CO3	L4
		OR			
6.	a)	Sketch and briefly explain any three operations that can be performed on a radial drilling machine.	7M	CO3	L4
	b)	Sketch and briefly explain any four operations that can be performed on an Universal milling machine.	7M	CO3	L2
		UNIT–I			
7.	a)	How are the abrasives selected for a grinding operation? Explain the reasons for their selection.	7M	CO4	L3
	b)	"Grinding is a mixture of different cutting processes". Justify it.	7M	CO4	L5
		OR			
8.	a)	How broaching operation is done on a horizontal pull type broaching machine?	7M	CO4	L3
	b)	Explain the basic principle of metal removal in grinding.	7M	CO4	L2
		UNIT–I			
9.	a)	Define Lapping operation and discuss the advantages and applications of Lapping operation.	7M	CO5	L1
	b)	Sketch and describe the honing process along with its advantages and applications.	7M	CO5	L4
		OR			
10.	a)	Define a jig and discuss any one types of drilling jigs along with its applications.	7M	CO5	L3
	b)	Explain the essential characteristics applications of jigs and fixtures.	7M	CO5	L2

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