Hall Ticket Number :										

R-15

Code: 5G551

III B.Tech. I Semester Supplementary Examinations August 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)	Discuss the effect of operating variables on the performance of Rankine cycle.	7M	CO1	L2
	b)	A simple Rankine cycle works between pressure 28 bar and 0.06 bar, the initial conditions of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption rate.	7M	CO1	L3
		OR			
2.	a)	Explain the modified Rankine cycle with P-V and T-S diagrams.	7M	CO1	L2
	b)	A basic steam power plant works on ideal Rankine cycle between 35 bar and 0.04 bar. The initial condition of steam being 0.85 dry and flow rate 15 kg/s. Determine: (i) Work required for pumping (ii) Work done by the turbine and (iii) Cycle efficiency.	7M	CO1	L3
		UNIT–II			
3.	a)	Derive an expression for draught produced in terms of height of chimney, ambient and flue gas temperature. State clearly the assumptions made.	7M	CO2	L3
	b)	Find the height of chimney necessary to produce a draught of 30 mm of water column. The atmospheric air temperature is 217 °C. Air fuel ratio is 13.5. What will be the power required if induced draught fan is used for producing the above draught? Fuel consumption is 1500 kg/hr.	7M	CO2	L3
		OR			
4.	a)	State functions of various mountings and accessories of a boiler.	7M	CO2	L2
	b)	Discuss the working of Benson boiler with a neat sketch.	7M	CO2	L2
		UNIT–III			
5.	a)	Derive the expression for maximum discharge through convergent divergent nozzle for steam.	7M	CO3	L3
	b)	Estimate the mass flow rate of steam In a nozzle with the following data. Inlet pressure and temperature =10 bar and 200°C, Back pressure=0.5 bar, Throat diameter =12mm.	7M	CO3	L3
		OR			
6.	a)	Explain the types of steam nozzles.	7M	CO3	L2
	b)	Dry saturated steam at a pressure of 5 bar enters in a nozzle and is discharged at a pressure of 1.5 bar. Find the final velocity of steam, when the initial velocity of the steam is neglected. If 10% of heat drop is lost in friction, find the % reduction In the final velocity.	7M	CO3	L3

UNIT–IV

7.	a)	Compare the merits and demerits of surface condensers over jet condensers	7M	CO4	L2
	b)	The following were obtained from the test of a surface condenser. Condenser vacuum=711 mm of Hg, hot well temperature=32°C, Inlet temperature of circulated water =12°C, outlet temperature of circulated water=28°C, Barometric reading=760 mm of Hg. Compute the vacuum efficiency and efficiency of condenser.	7M	CO4	L3

OR

8.	a)	Differentiate between jet condensers and surface condensers	7M	CO4	L2
	b)	In a surface condenser, the vacuum maintained is700 mm of Hg, the barometer reads 754 mm, if the temperature of condensate is 18^0C, determine: i) mass of air per kg of stream and ii) Vacuum efficiency.	7M	CO4	L3

UNIT–V

9.	a)	Give the classification of steam turbines.	5M	CO5	L2
	b)	The velocity of steam leaving the nozzles of impulse turbine is 1200 m/s and the nozzle angle is 20°. The blade velocity is 375 m/s and the blade velocity coefficient is 0.75. Assuming no loss due to shock at inlet, calculate for a mass flow of 0.5 kg/s and symmetrical blading i. Blade inlet angle ii. Driving force on the wheel iii. Axial thrust on the wheel iv. Power developed by Turbine.	9M	CO5	L3

OR

10.	a)	Give a comparison between Impulse Turbine and Reaction Turbine.	7M	CO5	L2
	b)	Derive an expression for maximum efficiency of 50% Reaction Turbine.	7M	CO5	L3

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Hall Ticket Number :										

R-15

Code: 5G554

III B.Tech. I Semester Supplementary Examinations August 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)	What important considerations are required to be taken into account while designing (i) cast parts and (ii) Welded parts?	4M	CO1	L1,L2
	b)	What is the importance of factor of safety and on what parameters does it depend?	4M	CO1	L1,L2
	c)	A weight 500 N is dropped into a platform at a height of 600 mm. The platform is supported by a steel bar of cross sectional area 625 mm^2. The bar is 1.25 m long and is supported at the top. Find maximum stress induced in the bar. What would be the stress, if the load is applied to be statically? Take E = 2 x 10^5 N/mm^2.	6M	CO1	L6
		OR			
2.	a)	What is the significance of theories of failure? Discuss the most commonly used theories.	6M	CO1	L1
	b)	The load on a bolt consists of an axial pull of 20 kN together with a transverse shear force of 10 kN. Determine the diameter of bolt required according to 1. Maximum principal stress theory; 2. Maximum shear stress theory; and 3. Maximum distortion energy theory. Take permissible tensile stress at elastic limit=100 MPa and poisons ratio=0.3	8M	CO1	L6
		UNIT–II			
3.	a)	What is S-N curve? How to estimate the endurance strength of standard specimen?	6M	CO2	L1
	b)	A flat plate subjected to a tensile force of 5 kN is shown in Fig.1. The plate material is grey cast iron FG 200 and factor of safety is 2.5. Determine the thickness of the plate.			

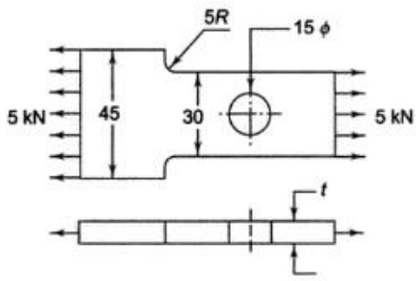

Fig.1 8M CO2 L6

OR

4.	a)	What is the Goodman's line? Derive the Goodman's line when a component is subjected to fluctuating stress.	4M	CO2	L3
	b)	A steel rod (σ_{ut} = 1089.5 MPa, σ_{yt} = 689.4 MPa, σ_{en} = 427.6 MPa) is subjected to a tensile load, which varies from 120 kN to 40 kN. Design the safe diameter of the rod using 'Soderberg diagram'. Adopt factor of safety as 2, stress concentration factor as unity and correction factors for load, size and surface as 0.75, 0.85 and 0.91 respectively.	10M	CO2	L6
		UNIT–III			
5.	a)	What are the different stresses set up in a bolt due to initial tightening? Explain these stresses in detail.	4M	CO3	L1,L2

b) A wall bracket is attached to a wall by means of four identical bolts, two at A and two at B, as shown in Fig.2. Assuming that the bracket is held against the wall and prevented from tipping about point C by all four bolts and using an allowable tensile stress in the bolts as 35 N/mm^2, determine the size of the bolts on the basis of maximum principal stress theory.

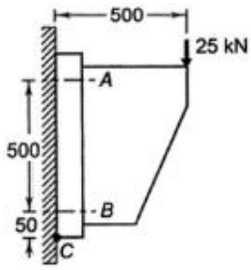

Fig.2 10M CO3 L6

OR

6. a) Define welding. What are the types of welded joints? Explain them briefly. 4M CO3 L2

b) A welded connection, as shown in Fig.3 is subjected to an eccentric force of 60kN in the plane of the welds. Determine the size of the welds, if the permissible shear stress for the weld is 100 N/mm^2. Assume static conditions.

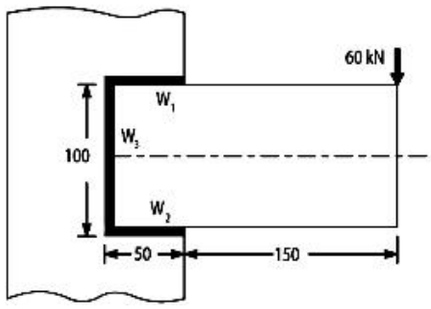

Fig.3 10M CO3 L6

UNIT–IV

7. a) What are the types of keys? Explain with diagram. 4M CO4 L1,L2

b) It is required to design a square key for fixing a gear on the shaft which transmits 10 kW power at 720 rpm. The shaft and the key are made of plain carbon steel C45 and factor of safety is 3.0. The yield tensile strength of C45 material is = 360N/mm^2. 10M CO4 L6

OR

8. Design a knuckle joint for a tie rod of a circular section to sustain a maximum pull of 70 kN. The ultimate strength of the material of the rod against tearing is 420 MPa. The ultimate tensile and shearing strength of the pin material are 510MPa and 396 MPa respectively. Determine the tie rod section and pin section. Take factor of safety = 6. 14M CO4 L6

UNIT–V

9. a) What do you mean by stiffness and rigidity of a shaft? 4M CO5 L1

b) A line shaft is driven by means of a motor placed vertically below it. The pulley on the line shaft is 1.5 metre in diameter and has belt tensions 5.4 kN and 1.8 kN on the tight side and slack side of the belt respectively. Both these tensions may be assumed to be vertical. If the pulley be overhang from the shaft, the distance of the centre line of the pulley from the centre line of the bearing being 400 mm, find the diameter of the shaft. Assuming maximum allowable shear stress of 42 MPa. 10M CO5 L6

OR

10. a) What is the difference between the rigid coupling and flexible couplings? 4M CO5 L1,L2

b) Two 35 mm shafts are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shafts transmit a torque of 800 N-m at 350 r.p.m. For the safe stresses mentioned below, calculate 1. Diameter of bolts; 2. Thickness of flanges; 3. Key dimensions; 4. Hub length; and 5. Power transmitted.

Safe shear stress for shaft material = 63 MPa
Safe stress for bolt material = 56 MPa
Safe stress for cast iron coupling = 10 MPa
Safe stress for key material = 46 MPa 10M CO5 L6

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Hall Ticket Number :										

R-15

Code: 5G552

III B.Tech. I Semester Supplementary Examinations August 2021

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Deduce an expression for fictional torque for a flat collar with uniform pressure condition.	7M	CO1	L2.L3
	b)	In a thrust bearing, he outside and inside diameters of collar are 240mm and 120 mm respectively. The axial load on the collar is 90kN. The intensity of pressure is 0.3 N/mm^2. Coefficient of friction is 0.1. Calculate the total frictional torque assuming uniform wear theory.	7M	CO1	L3,L4
		OR			
2.	a)	Describe with neat sketch the working principle of a single plate clutch.	7M	CO1	L2,L3
	b)	In a cone clutch, the mean diameter of friction lining is 6 times its width. The coefficient of friction of 0.27. The allowable pressure on fiction lining is 0.1 MPa. Assuming uniform wear, find the diameters and width of friction lining required to transmit 9 kW at 900 rpm. The allowable pressure on friction lining is 0.18 MPa. The semi cone angle is 15^0.	7M	CO1	L3,L4
		UNIT–II			
3.		A differential band brake has a drum diameter of 600 mm. The two ends of the band are fixed to the pins on the opposite sides of the lever fulcrum at distances of 50 mm and 160 mm from the fulcrum. The angle of contact of band is 240^0. Coefficient of friction is 0.3. Find the breaking torque if a force of 300 N is applied at the end of lever of length 900 mm from fulcrum.	14M	CO2	L3.L4 & L5
		OR			
4.	a)	Derive the equation for gyroscopic couple GC = I_p	6M	CO2	L2,L3
	b)	An aeroplane makes a complete half circle of radius 50 M towards left when flying at a speed of 300 km/hour. The mass of rotating parts of engine and propeller is 400 kg and have a radius of gyration of 0.3 m. The engines runs at 3000 rpm counter clockwise when viewed from rear. Determine the gyroscopic couple and discuss its effect on the aeroplane.	8M	CO2	L3,L4 & L5
		UNIT–III			
5.		The turning moment diagram for a multi cylinder engine has been drawn to a scale of 1 mm = 600 N-m on y-axis and 1 mm = 5 ^{0} on x-axis. The areas above and below the mean resisting line taken in order are -30, +300, -250, +360, -270, +300, -360, +330 and -380 mm^2. The fluctuation of speed is to be limited to ± 1.8 % of the mean speed which is 500 rpm. The density of material is 7200 kg / m^3. The hoop stress for the material is 5 N / mm^2. Find the mass of the rim type fly wheel neglecting the effect of arms and hub.	14 M	CO3	L3,L4 & L5
		OR			

6.		In a spring loaded governor of Hartnell type, the horizontal and vertical arms are of equal length. The mass of each ball is 1.5 kg. The extreme radii of rotation of the governor balls are 105 mm and 70 mm. The fulcrums of the bell crank levers are at a distance of 100 mm from the axis of rotation. The minimum equilibrium speed is 400 rpm and an increase in speed of 5 % is expected at the maximum radius of rotation. Neglecting the obliquity of the arms, determine i) the stiffness of the spring, ii) the initial compression in the spring and iii) The equilibrium speed corresponding to a radius of rotation of 90 mm.	14 M	CO3	L3,L4 & L5

UNIT–IV

7.		Four masses M1= 100 kg, M2 = 175 kg, M3 = 200 kg and M4 = 125 kg are fixed to a crank of 200 mm radius and revolve in planes 1, 2, 3 and 4 respectively. The angular positions of the masses in planes 2, 3 and 4 with respect to plane 1 are 75^0, 135^0 and 240^0 taken in the same sense. Distances of planes 2, 3 and 4 from plane 1 are 600 mm, 1800 mm and 2400 mm. Determine the magnitude and position of balancing masses at radius of 600 mm in planes L and M located in the middle of 1 and 2 and in the middle of 3 and 4 respectively.	14 M	CO4	L3,L4 & L5

OR

8.		The pistons of a 4 cylinder vertical inline engine reach their upper most position at 90^0 interval in order of their axial position. Pitch of the cylinder = 0.35 m. Length of the connecting rod = 0.42 m. Crank radius = 0.12 m. The engine runs at 600 rpm. If the reciprocating parts of the engine have a mass of 2.5 kg, find the unbalanced primary and secondary forces and couples. Take central plane of engine as reference plane.	14 M	CO4	L3,L4 & L5

UNIT–V

9.	a)	Define i) Degrees of freedom, ii) Resonance iii) Transverse vibration iv) longitudinal vibration v) frequency	5M	CO5	L2,L3 & L4
	b)	A shaft is 300 mm long with one end fixed. It carries a disc of mass 50 kg at its free end and another disc of mass 100 kg at a distance of 180 mm from fixed end. The moment of inertia is 4×10^{-7} m^4 and E = 196 GPa. Find the lowest frequency of vibration of the system.	9M	CO5	L2,L3 & L4

OR

10.		Derive an expression for natural frequency of transverse vibration by Dunkerley's method.	14M	CO5	L2,L3 & L4

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Hall Ticket Number :										

Code: 5G555

R-15

III B.Tech. I Semester Supplementary Examinations August 2021

Heat Transfer

(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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UNIT–I

1. a) Explain Fourier's law of heat conduction.
   b) Differentiate between thermodynamics and Heat transfer.

OR

2. a) Explain the concept of combined heat transfer mechanism with the help of Examples.
   b) Differentiate between Steady, Unsteady and Periodic heat transfer.

UNIT–II

3. a) Derive the equation for heat transfer for composite slab.
   b) Spherical shaped vessel of 1.5 m diameter is 75 mm thick. Find the rate of heat leakage, if the temperature difference between the inner and outer surfaces is 300^{o} C. Thermal conductivity of material is 0.3 kJ /mh^{o}C.

OR

4. a) Explain the criteria for lumped system analysis.
   b) Derive the expression for temperature distribution under one dimensional steady state heat conduction for a plane wall and generate the expression for heat flow through a plane wall.

UNIT–III

5. a) Explain the method of Buckingham π-theorem and its limitations.
   b) List out the dimensionless numbers used in forced convection situation and their mathematical expressions.

OR

6. a) Derive the governing equation and its solution by integral method in free convection.
   b) A furnace door, 1.5m high and 1m wide, is insulated from inside and has an outer surface temperature of 70^{0}C. If the surrounding ambient air is at 30^{0}C, calculate the steady state heat loss from the door.

UNIT–IV

7. a) Draw the flux plot and explain different regimes in it.
   b) Two large parallel planes with emissivities of 0.3 and 0.5 are maintained at temperatures of 527^{0} C and 127^{0}C respectively. A radiation shield having emissivities of 0.05 on both sides is placed between them. Calculate (i) Heat transfer rate between them without shield. (ii) Heat transfer rate between them with shield.

OR

8. a) Obtain the relation between intensity of radiation and emissive power.
   b) The net radiation from the surface of two parallel plates maintained at temperatures T1 and T2 is to be reduced by 79 times. Calculate the number of screens to be placed between two surfaces to achieve this reduction in heat exchange, assuming the emissivity of screens as 0.05 and that of surfaces as 0.8.

UNIT–V

9. a) Water flows at the rate of 60 kg/min through a double pipe counter flow heat exchanger. Water is heated from 50^{o}C to75^{o}C by oil flowing through the tube. The specific heat of the oil is 1.7 kj/kg.K. The oil enters at 120^{o}C and leaves at 70^{o}C.The overall heat transfer co-efficient is 340 W/m^{2}K.Calculate the following (i) Heat exchanger area. (ii) Rate of heat transfer.
   b) What is a Heat exchanger? Classify the heat exchangers and its applications.

OR

10. a) Derive NTU-Effectiveness relation for counter flow heat exchanger.
    b) Derive an equation for LMTD for counter flow heat exchanger.

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Hall Ticket Number :										

R-15

Code: 5G553

III B.Tech. I Semester Supplementary Examinations August 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)	Derive the expressions for chip reduction coefficient in a single point cutting tool. State the assumptions made?	7M	CO1	L6
	b)	Contrast Orthogonal and Oblique cutting.	7M	CO1	L2
		OR			
2.	a)	During an orthogonal machining (Turning) operation of C-40 steel, the following data were obtained: Chip thickness ratio =0.35 mm Width of cut =3.5 mm Tangential cutting force = 1150 N Feed force =280 N Cutting speed = 2.6 m/sec Rake angle $=+10^0$ Calculate (i) Force of shear at shear plane (ii) Kinetic coefficient of friction at the chip	7M	CO1	L3
	b)	What is a tool signature? Explain the importance of various elements in tool signature?	7M	CO1	L1
		UNIT–II			
3.	a)	Name any four operations which can be performed on a lathe and explain them briefly.	7M	CO2	L1
	b)	What are the basic parts of an engine lathe? Discuss the functions of a head stock.	7M	CO2	L1
		OR			
4.	a)	Write short notes on Capstan lathe.	7M	CO2	L1
	b)	Classify lathe machines. Explain the working of any one lathe with a neat sketch.	7M	CO2	L4
		UNIT–III			
5.	a)	Illustrate briefly about ram mechanisms used in a Slotter.	7M	CO3	L3
	b)	Contrast Slotter and Planner machines in contrast to types of operations.	7M	CO3	L2
		OR			
6.	a)	What are different tool holding devices used in drilling machine? Explain at least one tool holding device in detail.	7M	CO3	L1
	b)	What are the principal parts of a milling machine? Explain the functions of differential dividing head.	7M	CO3	L1
		UNIT–IV			
7.	a)	List various types of grinding machines? Describe the principle, advantages and limitations of surface grinding machine.	7M	CO4	L4
	b)	Describe the significance of dressing in grinding.	7M	CO4	L1
		OR			
8.	a)	Mention grinding wheel applications. Also explain different types of abrasives used in grinding wheels.	7M	CO4	L1
	b)	How broaching is done on horizontal push type broaching machines?	7M	CO4	L1
		UNIT–V			
9.	a)	Describe the process of honing. How honing and lapping differ?	7M	CO5	L2
	b)	Write the advantages and limitations of honing and lapping.	7M	CO5	L1
		OR			
10.	a)	How are jigs classified? Emphasize on the applications of drilling jigs.	7M	CO5	L2
	b)	State the basic rules of location.	7M	CO5	L1

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Hall Ticket Number :										

R-15

Code: 5GA51

III B.Tech. I Semester Supplementary Examinations August 2021

Managerial Economics and Financial Analysis

(Common to CE, ME & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *any five* full questions by choosing one question from each unit (5x14 = 70 Marks)

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	Marks	CO	Blooms Level

UNIT–I

1. Explain the meaning of Managerial Economics and state its relationship with other functional areas in decision making.

OR

2. Answer any two principles of Managerial Economics
   (a) Discounting Principle
   (b) Incremental Concept
   (c) Time Perspective

UNIT–II

3. What is elasticity of Demand and discuss the different types of price elasticity of Demand?

OR

4. Discuss the objectives, assumptions and importance of Break-even analysis.

UNIT–III

5. Explain Price-Output determination under perfect competition in long-run.

OR

6. Discuss the merits and demerits of Public and Private Sector Business Organizations.

UNIT–IV

7. From the following Trail Balance and additional information, you are required to prepare Final Accounts

From Prepare Final Accounts.

Particulars	Dr.	Cr.
	₹	₹
Capial		20,000
Sundry Debtors	5,400	
Drawings	1,800	
Plant & Mtachinery	7,000	
Sundry Creditors		2,800
Wages	10,000	
Purchases	21,000	
Opening Stock	4,000	
Bank Balance	3,000	
Carriage Charges	300	
Salaries	400	
Rent	900	
Sales		31,000
	53,800	53,800

Additional Information:

(i) Closing Stock ₹ 1,800.
(ii) Outstanding Rent ₹ 300 and outstanding wages ₹ 500.
(iii) Charge Depreciation on Plant & Machinery at 20%.

OR

8. What is Capital Budgeting and how do you calculate the Net Present Value for the project?

UNIT–V

9. Explain any three ratios of the following
   (a) Debtors turn-over ratio
   (b) Proprietory ratio
   (c) Fixed assets turn-over ratio
   (d) Absolute quick ratio

OR

10. With the help of the following ratios regarding XYZ Co, draw the Balance Sheet of the company for the year 2020.
   (i) Current Ratio : 2.5
   (ii) Liquidity Ratio : 1.5
   (iii) Net working Capital : ₹ 3,00,000
   (iv) Stock Turnover Ratio (Cost of sales/closing stock) : 6 times
   (v) Gross Profit Ratio : 20 per cent
   (vi) Fixed Assets Turnover Ratio (on cost of sales) : 2 times
   (vii) Debt Collection Period : 2 months
   (viii) Fixed assets to shareholders net worth : 0.80
   (ix) Reserve and surplus to capital : 0.50

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