Hall Ticket Number :										

R-17

Code: 7G562

III B.Tech. II Semester Regular Examinations Nov/Dec 2020

Design of Machine Elements-II

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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		Marks	CO	Blooms Level
1.	A Journal bearing 100mm diameter and 150mm long carries a radial load of 7KN at 1200r.p.m.The diametral clearance is 0.075mm. Find the viscosity of the oil being used at the operating temperature, if 1.2KW power is wasted in friction.	14M	1	IV
2.	A journal bearing 50mm in diameter and 75mm long supports a overhanging shaft at 900r.p.m. The room temperature is 30^0c and the bearing temperature is 75^0c. The viscosity of the oil used is 0.012kg/m-s at the operating temperature of 120^0c.Take diametrral clearance is 0.05mm and bearing is to operate in still air, without any artificial cooling. Find power lost in friction.	14M	1	IV
3.	The radial load and axial load on deep groove ball bearing respectively are 10KN and 3.5KN at a speed of 900r.p.m. Take radial factor 0.67, thrust factor 3.7 and service factor 1.5.Find dynamic load rating of the bearing for a desired life of 10000 hours.	14M	2	III
4.	Design a cast iron piston for a four stroke engine of bore: 100mm and stroke:120mm. Engine speed is 2000r.p.m. when fuel consumption is 0.15kg per BP per hour and mechanical efficiency 80%.HCV of fuel is 42MJ/kg and maximum pressure is 4MPa. Assume mean effective pressure 0.75MPa.	14M	3	V
5.	The following particulars refer to a 4-stroke cycle diesel engine. Cylinder bore =150mm, Stroke length=180mm, Speed=1200r.p.m Maximum explosion pressure=5MPa Ratio of the length of the connecting rod to the length of the crank=4, Factor of safety=6 .The material of the connecting rod is forged steel, with yield stress in compression of 350 MPa. Find the dimensions of I cross section of connecting rod.	14M	3	V
6.	Design a helical compression spring used for operating a valve. The spring is subjected to a load range of 100 to 150N,i.e, 100N when the valve is closed, and 150 N when it is open. The deflection of the spring, the valve lift during the above load ranges 7mm.Take spring index as 10. Determine the size of the wire, size and number of coils ,and pitch of the coils,	14M	4	II
7.	A steel spur pinion with 20^0 full depth involute teeth is transmitting 7.5kW power at 1000 r.p,m from electric motor. The starting torque of the motor is twice the rated torque. The number of teeth on the pinion is 25, while the module is 4mm. The face width is 45mm.Assuming that the velocity factor accounts for the dynamic load. Calculate effective load on the gear tooth and bending stress in the gear tooth.	14M	5	V
8.	Determine the power capacity of a fair of helical gears having a transmission ratio 8;3. The lower speed is 3000 r.p.m. The teeth are 20^0 full depth, 30^0 helix angle, 6mm module, and 100 mm face width. The material is untreated cast steel. The pinion has 27 teeth.	14M	5	IV

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Hall Ticket Number :										

R-17

Code: 7G563

III B.Tech. II Semester Regular Examinations Nov/Dec 2020

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
1.		Derive the general heat conduction equation in Cartesian coordinates. Simplify the obtained equation to Poisson's Equation, Fourier's Equation and Laplace Equation.	14M	1	3
2.	a)	Explain various modes and mechanism of heat transfer along with governing equations.	6M	1	2
	b)	Define the following: Thermal conductivity, Convective heat transfer coefficient, Radiation heat transfer coefficient and Overall heat transfer coefficient.	8M	1	1
3.	a)	Define Critical thickness of insulation. Obtain an expression for critical radius of insulation for a spherical shell.	8M	2	3
	b)	A steel pipe line (K=50W/mk) of I.D. 100mm and O.D 110mm is to be covered with two layers of insulation each having a thickness of 50mm. The thermal conductivity of the first insulation material is 0.06W/mK and that of the second is 0.12 W/mK. Calculate the loss of heat per meter length of pipe and the interface temperature between the two layers of insulation when the temperature of the inside tube surface is 250^{o}C and the outside surface of the insulation is 50^{o}C	6M	2	3
4.		Explain the procedure to form dimensionless groups by Buckingham–Л theorem and develop a relationship between Nuselt, Prantel and Reynolds Numbers in forced convection using dimensional analysis.	14M	3	2
5.	a)	Explain the development of hydrodynamic, thermal boundary layers over a flat plate and discuss the thickness of boundary layers.	6M	3	2
	b)	Air at 20°C at atmospheric pressure flows over a flat plate at a velocity of 3.5m/s. If the plate is 0.5m wide and at 60°C, calculate the following at x=0.4m i) Boundary layer thickness, ii) Thermal boundary layer thickness, iii) Average friction coefficient ., iv)The rate of heat transfer and v)Drag force on the plate .	8M	3	3
6.	a)	Discuss the various regimes in pool boiling	7M	4	2
	b)	Water is boiled at the rate of 30 kg/hr in a copper pan, 30cm in diameter, at atmospheric pressure. Estimate the temperature of the bottom surface of the pan assuming nucleate boiling conditions.	7M	4	3
7.	a)	Two parallel grey planes with emissivities of 0.8 and 0.7 are maintained at 800^{0}C and 1500^{0}C. What is the net radiant energy exchange? What would be the reduction in heat transfer if a radiation shield of polished aluminum (Emissivity = 0.04) is placed between them?	7M	4	3
	b)	Derive an expression for radiation heat exchange between two large parallel planes.	7M	4	3
8.	a)	What are fouling factors? Explain their effects in the heat exchangers design.	6M	5	2
	b)	Determine the overall heat transfer coefficient based on outer area of a 3.81cm O.D and 3.175 cm I.D brass tube(k = 103.8 W/m K) if the heat transfer coefficients for flow inside and outside the tubes are 2270 and 2840 W/m2 K respectively, and the unit fouling resistances at inside and outside are Rfi = Rfo = 8.8 x 10-3 m2 K/W.	8M	5	3

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Hall Ticket Number :										

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Code: 7G564

III B.Tech. II Semester Regular Examinations Nov/Dec 2020

Instrumentation and Control Systems

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
1.		Discuss briefly about the following static characteristics i. Accuracy ii. Precision iii. Drift iv. Sensitivity v. Calibration	14M	1	6
2.		Sketch schematic of a bourdon tube pressure gauge and explain it working. What is the sensitivity of this instrument?	14M	2	1
3.	a)	What are the salient features of a total radiation pyrometer?	7M	2	1
	b)	Discuss about the thermocouples and resistance thermometers	7M	2	6
4.	a)	What are the guiding principles for force measurement?	7M	3	1
	b)	Write notes on hydraulic cell.	7M	3	2
5.	a)	What are the different methods of measuring torque? Explain any one method with help instrument related.	9M	3	2
	b)	Write short notes on accelerometer	5M	3	1
6.	a)	What are properties required for strain gauge materials? List the materials suitable for resistance strain gauges.	7M	4	1
	b)	Write notes on strain rosettes.	7M	4	3
7.	a)	Compare open loop and closed loop systems.	7M	5	2
	b)	What are the elements of any generalized control system?	7M	5	1
8.	a)	What is transfer function? Obtain transfer function for spring-mass-damper system.	7M	5	5
	b)	What is a block diagram? What are its parts? Sketch block diagram for a simple closed loop system.	7M	5	1

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Hall Ticket Number :										

R-17

Code: 7GA61

III B.Tech. II Semester Regular Examinations Nov/Dec 2020

Managerial Economics and Financial Analysis

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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		Marks	CO	Blooms Level
1.	What is Managerial Economics? What are the chief characteristics of Managerial Economics?	14M		
2.	Explain how do you measure Elasticity of Demand. Illustrate. How do you interpret the different types of elasticity?	14M		
3.	Explain the following: i. Isoquants and their features ii. Cobb-Douglas Production Function	14M		
4.	Define BEP. How do you determine it? Show graphical presentation of Break Even Analysis?	14M		
5.	Who may be called sole proprietor? Briefly explain the characteristics of Sole Trading Concern?	14M		
6.	Define the term Capital Budgeting and explain the Discounted Cashflow Methods?	14M		
7.	Determine the payback period for a project which requires a cash outlay of Rs. 10,000 and generates cash flows of Rs. 2,000, Rs. 4000, Rs. 3000 and Rs.2000 in the 1, 2, 3 and 4^{th} years respectively.	14M		
8.	What is Accounting? Explain any five concepts from Generally Accepted Accounting Principles?	14M		

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Hall Ticket Number :										

R-17

Code: 7G561

III B.Tech. II Semester Regular Examinations Nov/Dec 2020

Applied Thermodynamics-III

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *any five* questions from the following (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
1.	a)	Describe with neat sketch the working of a simple constant pressure open cycle gas turbine.	7M	1	I
	b)	A gas turbine unit receives air at 100 kPa and 300K and compresses it adiabatically to 620 kPa with efficiency of the compressor 88%. The fuel has a heating value of 44180 kJ/kg and the fuel/air ratio is 0.017. The turbine internal efficiency is 90%. Estimate the compressor work, turbine work and thermal efficiency.	7M	1	VI
2.	a)	With the aid of a neat sketch, explain any one type of Jet propulsion system.	6M	1	II
	b)	A turbojet engine indicates 45 kg/s of air and propels an aircraft with a uniform flight speed of 880 km/h. The isentropic enthalpy change for nozzle is 188.37kJ/kg and its velocity coefficient is 0.96. The fuel-air ratio is 0.012, the combustion efficiency is 0.95 and the lower heating value of the fuel is 44,000kJ/kg. Estimate: i) the thermal efficiency of the engine, ii) the fuel flow rate in kg/h, iii) the propulsion power in kW, iv) the thrust power, and v) the propulsive efficiency.	8M	1	VI
3.	a)	Define refrigeration. Name the different types of systems used for cooling of aircraft cabin.	4M	2	I
	b)	An air refrigerator working on Bell-Coleman cycle takes in air at 1 bar and at a temperature of 10^0 C. The air is compressed to 5 bar abs. The same is cooled to 25^0 C in the cooler before expanding in the expansion cylinder to cold chamber pressure of 1 bar. The compression and expansion laws followed are $pv^{1.35}$ = C and $pv^{1.3}$ = C respectively. Estimate C.O.P of the plant and net refrigeration effect per kg of air. Take C_p = 1.009 kJ/kg K and R = 0.287 kJ/kg K for air.	10M	2	VI
4.	a)	Explain the different method of improving the COP of simple vapour compression refrigeration Cycle.	5M	2	II
	b)	A vapor compression machine is used to maintain a temperature of -23^0C in refrigerated space. The ambient temperature is 37^0C.The compressor takes in dry saturated vapor of F12. A minimum10^0C temperature difference is required at the evaporator as well as condenser. There is no sub-cooling of liquid. If refrigerant flow is rate is 1kg/min Estimate (i) Ton of refrigeration. (ii)Power requirement (iii) Ratio of COP of this cycle to COP of Carnot cycle.	9M	2	VI

5.	a)	Determine the COP of an ideal vapour absorption system in terms of temperature T_G at which heat is supplied to the generator, the temperature T_E at which heat is absorbed in the evaporator and the temperature T_C at which heat is discharged from the condenser and absorber?	6M	3	V
	b)	Describe with neat sketch Ammonia and water vapour absorption refrigeration system. What are its limitations?	8M	3	I
6.	a)	Explain the procedure to construct a RSHF line on a psychometric chart.	4M	4	II
	b)	The sling psychrometer reads 40^0C DBT and 28^0C WBT. Estimate the following: i. Specific humidity ii. Relative humidity iii. Vapour density in air iv. Dewpoint temperature v. Enthalpy of the mixture per kg of dry air. Assume atmospheric pressure is 1.03 bar.	10M	4	VI
7.	a)	With the aid of neat sketches, explain the working of any one type of type Filter.	6M	5	II
	b)	With the aid of a neat sketch, explain the working of an Air to Air heat pump circuit.	8M	5	II
8.	a)	With neat sketch explain construction and working of any one type of humidifier.	6M	5	II
	b)	Describe a centrifugal fan. What are the advantages of backward-blade fan over forward –blade fan?	8M	5	I

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