13/05/19 Lab.

BharatiyaVidyaBhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination May 2019

Program: B. Tech Mechanical | **Duration: 3 Hour**

Course Code: PCC-BTM601 | **Maximum Points: 100**

Course Name: Refrigeration and Air-Conditioning. | **Semester: VI**

Instructions:

1) Question no.1 is compulsory and solve any four questions out of remaining six.
2) Use of refrigerant properties and psychrometric chart is permitted.
3) Use of steam table is permitted.
4) Assume suitable data and justify the same.

Q.No.	Questions	Points	CO	BL	PI
1(a)	Explain use of liquid vapour regenerative heat exchanger in vapour compression refrigeration system.	5	1	1	1.4.1
1(b)	Explain GWP and ODP potential of a refrigerant.	5	3	2	1.4.1
1(C)	Derive equivalent diameter of circular duct is given by $D = 1.265 [(ab)^{0.6}/(a+b)^{0.2}]$.	5	3	3	2.2.2
1(d)	Explain process of adiabatic chemical dehumidification of air.	5	3	2	1.4.1
2(a)	Draw neat sketch of actual vapour compression cycle with p-h and T-S diagrams and explain it in detail.	8	1	1	1.4.1
(b)	A R134a machine operates at -15°C evaporator and 35°C condenser temperatures. Assuming a simple-saturation cycle, calculate the volume of the suction vapour and power consumption per ton of refrigeration and COP of the cycle. Calculate the same if the system has a regenerative heat exchanger with the suction vapour leaving at 20°C from the heat exchanger.	12	2	3	2.2.2
3(a)	Explain boot strap refrigeration system with neat sketch of schematic and T-s diagram.	8	1	1	1.3.1
(b)	A regenerative aircraft refrigeration system is employed in an aircraft flying at a speed of 1500 km/hr. The ambient conditions are 0.1 bar and -63°C. The ideal pressure recovery factor is 0.92. The pressure ratio in main compressor is 5. The air bled off from the main compressor is first cooled in the air cooler with a cooling ratio of 0.6. In regenerative heat exchanger air is further cooled to a temperature of 30°C by chilled air from the exit. A temperature of this cooling air which is bypassed is 92°C. The	12	2	3	2.2.2

	remaining air from the cooling turbine exit goes to the cabin. The isentropic efficiency of compressor and turbine is 90% and 80% respectively. The cooling turbine drives the cooling air fan which draws in the cooling ram air discharge from the air cooler. The cabin is to be maintained at 1.01 bar and 27°C. Find (i) The mass of air bypassed for cooling purposes in regenerative heat exchanger in kg/min. Take tonnage capacity 30 TR. (ii) Mass of bleed off air in kg/min. (iii) COP of the unit excluding the power required in ram compression.				
4(a)	Explain complete designation system of all types of refrigerants and also discuss about replacement of CFC refrigerants.	10	3	2	1.3.1
(b)	Explain how air washer can be used as means of year around air conditioning.	10	3	2	
5(a)	The DBT and WBT of the air are 40°C and 28°C respectively. Find the followings if total air pressure is 1.03 bar. Calculate following without using psychrometric chart. (i) Specific humidity (ii) Relative humidity (iii) DPT (iv) density (iv) Enthalpy.	10	3	3	2.1.2
(b)	Discuss in detail about various dynamic losses occurring in ducts	10	2	2	1.3.1
6	A building has the following calculated cooling loads: Room sensible heat gain = 310 kW Room latent heat gain = 100 kW The space is maintained at DBT of 25°C and relative humidity of 50 %. The outdoor air is at 38°C and 50% R.H. And 10 % by mass of air supplied to the building is outdoor air. If the air supplied to the space is not at temperature lower than 18°C. Find (i) Minimum amount of air supplied to space in m^3/s. (ii) Volume flow rates of return air and outdoor air (iii) State and volume flow rate of air entering the cooling coil. (iv) Capacity, ADP, BPF and SHF of the cooling coil.	20	4	3	2.4.1
7(a)	What is effective temperature? Explain what comfort chart is and also explain human comfort.	10	3	2	1.3.1
(b)	Explain working of practical single effect water-lithium bromide absorption chiller with neat sketch.	10	3	2	1.3.1

15/5/19 Lab 9:30

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester – May 2019 Examinations

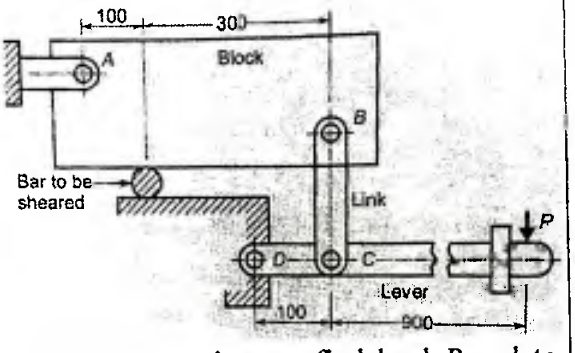
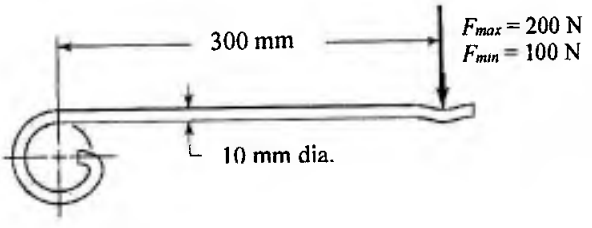
Program: B.Tech. in Mechanical Engineering | **Duration: 3 Hours**

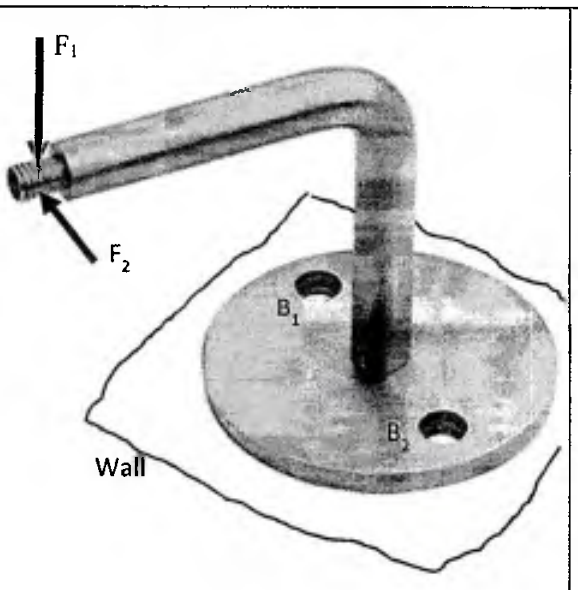
Course Code: PCC-BTM602 | **Maximum Points: 100**

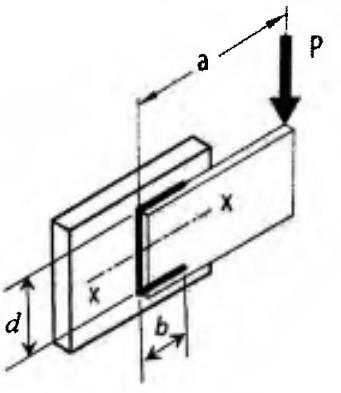
Course Name: Machine Design-I | **Semester: VI**

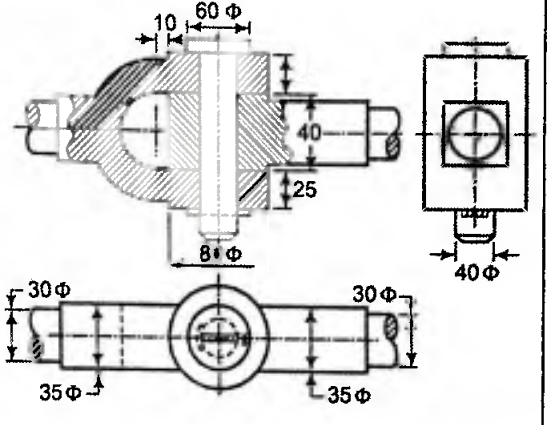
Notes:

1. **Question no. 1 is compulsory**, solve any 4 out of remaining 6 questions.
2. Use of Design Data Book is permitted. Assume suitable data if necessary.

Q. No.	Questions	Points	CO	BL	PI
Q1	A) Figure shows design of a bench-shearing machine which is used to shear mild steel rods of diameter up to 6.5 mm. Analyze the loading acting upon various machine elements and develop the procedure including necessary equations to find load P and to calculate size of link BC and diameter of pins at locations B and C. Do not do numerical calculations. 	(6)	1	4	2.2.3
	B) Figure shows a formed round wire cantilever spring subjected to varying load F. The UTS of spring material is 1000 MPa. The spring is mounted in such way that there is no stress concentration. The visual inspection of springs indicate that the surface finish closely corresponds to hot-rolled finish. Ignore curvature effects on bending stress. Analyze the problem and suggest a procedure to calculate fatigue life of the spring. Do not do detailed numerical calculations. 	(6)	2	4	2.1.3
	C) Figure shows a steel hand rail bearer which is fixed to wall using two bolts. At the threaded end, hand rail pipe is attached. The forces acting	(6)	2	4	2.1.3

	on threaded end are F_1 and F_2 as shown. Develop a procedure to find size of two bolts B_1 and B_2. Assume necessary dimensions for the hand rail bearer to perform calculations. D) Describe following terms and mention their significance in design of machine elements: (i) preferred number series, (ii) factor of safety.		**(2)**	*3*	*2*	*1.4.1*
Q2	A) A railway wagon moving at a velocity of 1.0 m/s is brought to rest by a bumper consisting of two helical springs arranged in parallel. The mass of wagon is 1000 kg. The springs are compressed by 140 mm in bringing the wagon to rest. The spring index can be taken as 6. The springs are made of oil hardened and tempered steel wire of SW grade (G = 81370 MPa). For the purpose of initial trial, wire diameter may be assumed as 12 mm. Calculate: (i) wire diameter (only first iteration), (ii) mean coil diameter, (iii) number of active coils.		**(10)**	*2*	*3*	*3.1.6*
	B) Design screw for a screw jack with load capacity of 15 kN and maximum lifting height of 500 mm. Do not perform design calculations for nut, lifting collar/handle and support frame. Describe design procedure for sizing of nut. Perform only single design iteration. Freehand draw assembly of the screw jack.		**(10)**	*4*	*5*	*3.3.1*
Q3	A) A machine tool shaft carries a gear at its midspan between two bearing supports. The bending moment at the gear varies from 100 Nm to 500 Nm and the torque in shaft varies from 50 Nm to 175 Nm in synchronization with bending moment. The shaft is made of steel 35C8. The corrected endurance limit of the shaft is 225 MPa. Determine the diameter of shaft with factor of safety of 1.5.		**(10)**	*2*	*3*	*2.1.3*
	B) It is required to select a standard belt to drive a saw mill running at 720 rpm. The saw mill is driven by 12 kW, 1440 rpm motor. Space		**(10)**	*2*	*3*	*3.3.1*

	available for center distance is 3.0 meters. The belt is open type. Select suitable standard belt and determine its length.				
Q4	A) A flat plate is attached to a support structure using fillet weld as shown in the figure. The load acting on plate *P* is 1.0 kN. Consider a = 400 mm, d = 200 mm and *b* = 100 mm. Determine size of the weld if the allowable shear stress is limited to 75 MPa. (Hint: Refer to Design Data Book). 	**(10)**	*2*	*3*	*2.1.3*
	B) A chain drive is used to connect a 5 kW, 1200 rpm I.C. engine (with mechanical drive) to a paper pulp grinder with speed reduction of 3:1. Select standard roller chain for the drive.	**(5)**	*2*	*3*	*2.1.3*
	C) Compare between belt and chain drives. Give practical examples of application of both types of drives.	**(5)**	*2*	*5*	*2.2.4*
Q5	A) List different types of materials which are commonly used in industrial machines. Recommend materials for following applications with brief reason supporting your answer: (i) Gears in transmission system of racing car, (ii) Body cover for a mud pump, (iii) Surgical tools, (iv) steam superheater tubes operating at high pressures and temperatures, (v) blades of stone crushing machine.	**(5)**	*3*	*2*	*3.1.5*
	B) Describe the significance of Soderberg, Goodman and Yield line in design for cyclic loads. Support your answer with neat sketches.	**(5)**	*3*	*2*	*2.1.3*
	C) Design a bushed pin type flexible coupling to connect the output shaft of 4-cylinder petrol engine to shaft of pulveriser. The engine delivers 25 kW power at 2400 rpm.	**(10)**	*3*	*3*	*2.1.3*
Q6	A) A leaf spring consists of 3 extra full-length leaves and 7 graduated length leaves, including the master leaf. Each leaf is 8 mm thick and 60 mm wide. The center to center distance between two eyes is 1.2 m. The leaves are pre-stressed in such a way that when the load is maximum, stress induced in each leaf is same and equal to 320 MPa. Determine: (i) the maximum force that the spring can withstand, (ii) initial nip, (iii) initial pre-load required to close the gap.	**(10)**	*2*	*3*	*2.1.3*
	B) The shaft for driving a conveyor system in a factory for movement of finished television screens is required to transmit 2 kW power at 600	**(5)**	*2*	*3*	*2.1.3*

	rpm. The shaft is subjected to maximum bending moment of 200 N-m. Shaft material is 30C8. Recommend suitable diameter for the shaft using ASME method. Also select standard parallel key for the shaft. C) Discuss the merits and demerits of bolted joints against those of welded joints. Give few examples of industrial applications where each type of joint is preferred.	(5)	3	2	2.2.4
Q7	A) A company manufacturing small-size lathe machines, supplies these to engineering institutes which are their major customers. The company has approached you to provide recommendations to make their products better in terms of ergonomic and aesthetic features for their end-users which are engineering students. Briefly give outline of your recommendations with necessary justifications.	(5)	3	3	2.1.3
	B) List different types of keys along with their typical applications. Derive expressions to calculate stresses in parallel keys for a shaft of specified diameter and subjected to torsional loads.	(5)	2	3	2.1.3
	C) A knuckle joint designed to carry axial tensile static load of 40 kN is shown in figure. All parts are made of carbon steel 30C8. Calculate factor of safety for the fork against crushing and shear failure. If the axial load is fluctuating instead of static, will there be any change in design procedure? Briefly comment.  	(5)	1	3	2.1.3
	D) Welding is one of the most important manufacturing processes. However, while designing welded assemblies certain principles or guidelines must be followed to avoid problems during manufacturing. Describe few of the guidelines for design of welded assemblies with supporting examples and sketches.	(5)	3	2	2.1.2

Lab
17/5/19
[9:30]

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058.

End Exam May 2019

Max. Marks: 100 Duration: 3 hr.

Class: Third Year Semester: VI Program: Mechanical Engineering

Name of the Course: Manufacturing Planning and Control Course Code : PCC-BTM605

Instructions:

- Question 1 is compulsory
- Attempt any Four questions out of Five questions.
- Figures to the right indicate full marks
- Assume suitable data wherever required.
- Use of Standard Normal Distribution table permitted.
- Graph papers are needed to solve the relevant problems

Question No		Maximum Marks	Course Outcome	BL	PI
Q1A	State and explain 20 barriers for Lean Implementation .	10	CO1	3	7.1.2
Q1B	State and explain Roadmap for successful Lean Implementation in manufacturing organization.	10	CO1	4	7.1.2
Q2A	Write the Short notes on the followings. • Material Requirement Planning • Scatter Plot, Karl Pearson coefficient of Co-relation, LSM of Forecasting	10	CO1	2	4.3.2
Q2B	Write the Short notes on the followings. • Total Productive Maintenance • DMAIC	10	CO1,	2	7.2.2
Q3A	Explore the 40 ways to reduce cost of inventory.	10	CO3, CO4	4	11.1.
Q3B	Derive necessary Expressions for Basic Model of Inventory Control	10	CO3, CO4	3	11.1.
Q4A	Compute the Safety Stock , Reserve Stock and Buffer stock for the data given below. Normal Usage=100 per week Lead Time=4 to 6 week Minimum Usage=50per week Maximum Usage= 150 per week Reorder Point =600 units	**10**	CO3	4	11.2.

	Calculate the reorder level, minimum and maximum levels of inventory and also average level of inventory.				
Q4B	A manufacturer of biscuits is considering four types of gift packs containing three types of biscuits. Orange cream OC , Chocolate cream CC, Wafors W, market research study conducted recently to assess the preferences of consumers shows the followings types of assortments to be in good demand.	10	CO2	4	1.1.2

Assort-ments	Contents	Selling Price per kg [Rs]
A	Not less than 40% of OC Not More Than 20% of CC Any Quantity of W	20
B	Not less than 20% of OC Not More Than 40% of CC Any quantity of W	25
C	Not less than 50% of OC Not more than 10% of CC Any quality of W	22
D	No Restrictions	12

For biscuits The manufacturing capacity and costs are given below.

Biscuits variety	Plant Capacity kg/day	Manufacturing cost Rs/Kg
OC	200	8
CC	150	9
W	150	7

Formulate a linear programming problem to find the production schedule which maximize the profits assuming no market restrictions.

Q5A	A project schedule has following characteristics.	10	CO2 CO3	4	11.3.2

Activity	Time in weeks	activity	Time in weeks
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

Construct Network , compute E and L for each event. Find the ES ,EF,LS,LF Find critical path. State the duration of project.

Q5B	The automobile company manufactures around 150 scooters. The daily Production varies from 146 to 154 depending upon the availability of raw materials and other working conditions.	10	CO2, CO3	5	1.1.2

Production per day	Probability
146	0.04

	147 | 0.09 148 | 0.12 149 | 0.14 150 | 0.11 151 | 0.10 152 | 0.20 153 | 0.12 154 | 0.08 The finished scooters are transported in a specially arranged lorry accommodating a 150 scooters. Using following random numbers. 80,81,76,75,64,43,18,26,10,12,65,68,69,61,57 simulate the process to find out What will be average number of scooters waiting in the factory if not loaded? What will the average number of empty space on the lorry if not filled?				
Q6A	The fixed costs for the year Y is Rs. 7, 00,000. Variable cost per unit is Rs.35. the estimated sales for the period are valued at Rs. 20, 00,000. Each unit sells at Rs. 200. a) Find the breakeven point b) If Rs. 16, 00,000 will be the likely sales turnover for the next budget period, calculate the estimated contribution and profit. c) If a profit target of Rs. 6, 00,000 has been budgeted, compute the turnover required. Write short note Break Even Analysis. Refer following points. BEP , Angle of Incidence	10	C02	4	11.2.1
Q6B	Breweries Ltd have two bottling plants, one located at 'G' and the other at 'J'. Each plant produces three drinks A, B and C. The number of the bottles produced per day are shown in the table.	10	CO1, CO2	4	2.1.1

Drinks	Plant at	
	G	J
A	1500	1500
B	3000	1000
C	2000	5000

A market survey indicates that during the monthly of July, there will be a demand od 20000 bottles of A, 40000 bottles of B and 44000 bottles of C. The operating cost per day for plants of G and J are 600 and 400 monetary units. For how many days each plant be run in July so as to minimize the production cost, still meeting the market demand? Formulate this problem as an LP problem and solve that using graphical method.

Q7A	Two major parts P_1 and P_2 for a product require processing through six machine centres. Two technological sequence of the parts on six machines and manufacturing times on each machine are, Part P_1: M/c Sequence: D A E C F B; Time (hrs.): 13 4 5 3 7 11 Part P_2: M/c Sequence: B A E F C D; Time (hrs.): 3 2 16 4 3 6 Use graphical method 1. Find optimal sequence of the jobs on the machines. 2. Find the total elapsed time to process all the jobs. 3. Find the idle time for each job. 4. For each machine specify the job that should be done first.	10	CO1, CO2	4	2.2.4
Q7B	An automobile dealer wishes to put four repairmen to four different jobs. The repairmen have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The dealer has estimated the number of man- hours that would be required for each job man combination. This is given in the matrix form in the table below. Find the optimal assignment. Suggest the optimal assignment of the men to jobs. JOB/ MAN: A B C D 1: 5 3 2 8 2: 7 9 2 6 3: 6 4 5 7 4: 5 7 7 8	10	CO2	4	3.3.1

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Lab
20/3/19. [1:30]

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations

May 2019

Program: Mechanical Engineering | **Duration: 03 hr**

Course Code: PCC BTM 604 | **Maximum Points: 100**

Course Name: Internal Combustion Engine | **Semester: VI**

Notes:

- **Question No. 1 is compulsory.**
- Attempt **any Four questions** out of remaining six questions.
- Answers to all sub questions should be grouped together.
- All questions carry equal marks.
- Make suitable assumptions with proper explanations.

Q. No.		Points	CO	BL	PI
Q. 1	**Answer the following questions (any Five)**	**20**	1 - 3	1-7	1.2.1
a)	What do you mean by normal and abnormal combustion in S I Engines? What are the parameters that govern the normal combustion in S I Engine?				
b)	Discuss the important qualities of SI engine fuel.				
c)	Explain Phenomenon of dissociation.				
d)	What are the functions of a nozzle? Draw a schematic diagram of Bosch type Fuel pump.				
e)	What are the main sources of pollutants from petrol engine? Discuss the adverse effects of emissions on human health.				
f)	By suitable sketches, show the various possible cylinder arrangement of I. C. Engine with some advantages.				
Q. 2 (A)	An experimental 4-Stroke gasoline engine of 1.7 litre capacity is to develop maximum power at 5000 rpm. The volumetric efficiency is 75% and the A/F ratio is 14:1. Two carburetors are to be fitted and it is expected that at maximum power the air speed at the choke is 100 m/s. The coefficient of discharge for the venturi is assumed to be 0.80 and that of main jet is 0.65. An allowance should be made for emulsion tube, the diameter of which can be taken as 1/3 of choke diameter. The gasoline surface is 6 mm below the choke at this engine condition. Calculate the sizes of a suitable choke and main jet. The sp. gr. of the gasoline is 0.75. Take atmospheric condition as 1 bar and 300 K.	**10**	3	2	2.1.1

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(B)	Enumerate the requirements of fuel injection systems for C.I. engines. With a schematic diagram, explain the working of distributor type fuel injection system. What are its advantages and disadvantages?	**10**	2 & 3	3	
Q. 3 (A)	An eight-cylinder, four stroke diesel engine has a power output of 386.4 kW at 800 rpm. The fuel consumption is 0.25 kg/kWh. The pressure in the cylinder at the beginning of injection is 32 bar and the maximum cylinder pressure is 55 bar. The injector is expected to be at 207 bar and the maximum pressure at the injector is set to be about 595 bar. Calculate the orifice area required per injector if the injection takes place over 12° crank angle. Assume the following: Specific gravity of fuel=0.85; coefficient of discharge for the injector = 0.6; atmospheric pressure = 1.013 bar; the effective pressure difference is the average pressure difference over the injection period.	**10**	3	3	2.2.2
(B)	Willian's line test is conducted on a constant speed diesel engine operating at 1500 rpm and developing 50 kW BP at full load. Willian's line may be considered as a straight line upto 60% load, with the slope of the line being 8°. The fuel consumption for this engine is 2.46 kg/hr at 10 % load. Take CV of fuel = 42 MJ/kg. Calculate (1) FP, (2) fuel consumption in kg/hr at 60% load, (3) brake thermal efficiency at 60% load, (4) mechanical efficiency at 40% load, (5) Brake Torque at 40% load.	**10**	4	4	2.1
Q. 4 (A)	A Morse test on 12 cylinders, two stroke C.I. engine of bore 40 cm and stroke 50 cm, running at 200 rpm. The following results were obtained during test:	**10**	4	4	3.1.1

Condition	Break load (N)	Condition	Break load (N)
All firing	2040	7st cylinder	1835
1st cylinder	1830	8nd cylinder	1860
2nd cylinder	1850	9rd cylinder	1820
3rd cylinder	1850	10th cylinder	1840
4th cylinder	1830	11th cylinder	1850
5th cylinder	1840	12th cylinder	1830
6th cylinder	1855	All firing	2060

The output is obtained from dynamometer by using equation:
BP= WN/180,
Where, W= Break load in N and N= speed in rpm. Calculate IP, mechanical efficiency and BMEP.

(B)	Describe the combustion Phenomenon in SI engines with help of p-θ diagram and explain each stages of combustion.	**10**	2	3	3.1.1
Q. 5 (A)	**I)** Explain Four stroke I.C. engine is always economical and less pollutant than two stroke I.C. Engine. What is the purpose of carrying out exhaust gas analysis?	**05**	1	5	2.1.1
	II) What are the different functions of lubricating systems? State the different lubricating systems used in I C Engines. Explain any one of them.	**05**	1	6	

(B)	The following observations were made during the test on oil engine : B.P. of the engine = 31.5 kW, Fuel used = 10.5 kg/hr, C.V. of the fuel = 43000 kJ/kg, Jacket circulating water = 540 kg/hr, Rise in temperature of cooling water = 56 °C Exhaust gases are passed through the exhaust gas calorimeter for finding the heat carried away by the exhaust gases. Water circulated through exhaust gas calorimeter = 454 kg/hr, Rise in temperature of water passing through exhaust gas calorimeter = 36°C, Temperature of exhaust gas leaving the exhaust gas calorimeter = 82°C, A/F ratio = 19.1, Ambient temperature = 17°C, Cp for exhaust gases = 1 KJ/kgK Draw up the heat balance sheet on minute and percentage basis.	**10**	4	4	2.2.2
Q. 6 (A)	An air compressor is being run by the entire output of a supercharged 4-stroke cycle diesel engine. Air enters the compressor at 25°C and is passed on to a cooler where 1210 kJ per minute is rejected. The air leaves the cooler at 65°C and 1.75 bar. Part of this air flow is used to supercharge the engine which has a volumetric efficiency of 72% based on induction manifold condition of 65°C and 1.75 bar. The engine which has six cylinders of 100 mm bore and 110 mm stroke runs at 2000 rpm and delivers an output torque of 150 Nm. The mechanical efficiency of engine is 80%. Determine : (i) The indicated mean effective pressure of the engine; (ii) The air consumption rate of the engine; (iii) The air-flow into compressor in kg per min.	**10**	4	3	2.1.1
(B)	**I)** Why is it necessary to cool the engine? What is optimum cooling? What are the advantages and disadvantages of air cooling over water cooling?	**05**	2		1.3.1
	II) A good CI engine fuel is a bad SI engine fuel and vice versa. Discuss the validity of the above statement in the light of the eight factors to reduce knocking in SI and CI engines.	**05**	2		
Q.	**Write short note on following (any five)** **(A)** Octane Number and Cetane Number **(B)** Advantages and disadvantages of using hydrogen in SI engine **(C)** The air pollution norms recently used and how alternating fuels are suitable for recent developed engines. **(D)** Scavenging of two stroke engines. **(E)** Factors that limit the compression ratio in SI and CI engines **(F)** Five important efficiencies of IC engines with appropriate applications **(G)** Advantages and disadvantages of air cooling over water cooling	**20**	2	1-7	1.3.1

Lab ~~Exam~~
12/07/19

BharatiyaVidyaBhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Re-Examinations

July 2019

Program: Mechanical Engineering | **Duration: 03 hr**

Course Code: PCC BTM 604 | **Maximum Points: 100**

Course Name: Internal Combustion Engine | **Semester: VI**

Notes:

- **Question No. 1 is compulsory.**
- Attempt **any Four questions** out of remaining six questions.
- Answers to all sub questions should be grouped together.
- All questions carry equal marks.
- Make suitable assumptions with proper explanations.

Q. No.		Points	CO	BL	PI
Q. 1	**Answer the following questions (any Five)**	**20**	1 - 3	1-7	1.2.1
a)	What is the difference between turbocharging and mechanical supercharging?				
b)	Explain the objective of performing heat balance sheet.				
c)	What do you understand by crankcase ventilation and what is its importance?				
d)	What is accelerating system in a carburetor? Is it an essential system of desirable system?				
e)	What do you understand by pumping loss? How does it vary with load in SI and CI engines?				
f)	Define volumetric efficiency and explain its importance in I. C. Engine.				
Q. 2 (A)	A 4-Stroke, 4-cylinder diesel engine running at 2000 rpm develops 60 kW. Brake thermal efficiency is 30% and calorific value of fuel is 42 MJ/kg. Engine has a bore of 120mm and stroke of 100 mm. Take density of air = 1.15 kg/m^3, A/F ratio = 15:1 and mechanical efficiency = 80%. Calculate i) fuel consumption in kg/sec, ii) air consumption in m^3/sec, iii) indicated thermal efficiency, iv) volumetric efficiency v) BMEP.	**10**	3	2	2.1.1
(B)	With the help of pressure crank angle diagram, explain the various stages of combustion in S. I. engine. What do you understand by detonation in SI engine? How does it differ from knocking in CI engine?	**10**	3	3	1.3.1

PTO

Q. 3 (A)	A simple jet carburetor is required to supply 5 kg of air per minute and 0.5 kg of fuel per minute of density 750 kg/m^3. The air is initially at 1 bar and 27°C a) Calculate the throat diameter of the choke for flow velocity of 100 m/s. Velocity coefficient = 0.8. b) If the pressure drop across the fuel metering orifice is 0.80 of that at the choke, calculate the orifice diameter assuming C_{df} = 0.60.	**10**	3	3	2.2.2
(B)	A 4 stroke C.I. engine develops a power of 25 kW per cylinder at 2500 rpm. The specific fuel consumption is 0.30 kg/kWhr for a fuel with 30°API. The fuel is injected at a pressure of 150 bar over a crank travel of 25°. The pressure in the combustion chamber is 40 bar. Coefficient of velocity is 0.875 and specific gravity is given by $SG = \frac{141.5}{(131.5+°API)}$. Calculate diameter of fuel injector orifice.	**10**	4	4	2.1.1
Q. 4 (A)	The air flow to a 4 stroke, 4 cylinder Diesel Engine is measured by means of a circular orifice of diameter 50 mm. The coefficient of discharge of the orifice meter is 0.60. During a test on the engine the following data were recorded: The bore and stroke of the engine measures are 100 mm and 120 mm respectively, Speed = 1200 rpm, brake torque = 120 Nm, fuel consumption = 5 kg/hr and CV of fuel = 42 MJ/kg. Pressure drop across orifice is 4.6 cm of water. Ambient temperature and pressure are 17°C and 1 bar respectively. Determine: 1) Thermal efficiency on brake power basis, 2) BMEP, 3) Volumetric efficiency based on free air condition	**10**	4	4	3.1.1
(B)	Explain the effect of supercharging on power output, mechanical efficiency and specific fuel consumption. What are the limitations of supercharging?	**10**	2	3	1.3.1
Q. 5	**I)** With a sketch, explain the working of a two stroke I.C. engine.	**05**	1	5	1.2.1
	II) Enlist various methods used to determine indicate power of an engine.	**05**	1	6	1.2.1
(A)	Explain any one method in detail.				
(B)	A 4-cylinder, 4-stroke C I engine develops 200 kW at 2000 rpm. Its BSFC is 0.25 kg/kWh. The injector pressure is 200 bar at the beginning of injection and 500 bar at the end of injection. The injection period is 20°of crank angle. The pressures inside the cylinder at the beginning and end of injection are 30 bar and 50 bar respectively. Take density of fuel as 850 kg/m^3 and coefficient of discharge for the injector C_f as 0.8. Assume effective pressure of injection is equal to average pressure difference over the period of injection. Find the diameter of the fuel injector.	**10**	4	4	2.2.2
Q. 6 (A)	An air compressor is being run by the entire output of a supercharged 4-stroke cycle diesel engine. Air enters the compressor at 25°C and is passed on to a cooler where 1210 kJ per minute is rejected. The air leaves the cooler at 65°C and 1.75 bar. Part of this air flow is used to supercharge the engine which has a volumetric efficiency of 72% based on induction manifold condition of 65°C and 1.75 bar. The engine which has six cylinders of 100 mm bore and 110 mm stroke runs at 2000 rpm and delivers an output torque of 150 Nm. The mechanical efficiency of engine is 80%. Determine : (i) The indicated mean effective pressure of the engine;	**10**	4	3	2.1.1

	(ii) The air consumption rate of the engine;				
	(iii) The air-flow into compressor in kg per min.				
(B)	**I)** Enlist and explain at least two types of alternative fuels for SI and CI engines.	**05**	2		1.3.1
	II) Explain with neat sketch the working of battery ignition system.	**05**	2		1.3.1
Q. 7	**Write short note on following (any five)**	**20**	2	1-7	1.3.1
	(A) Two stroke engine versus four stroke engines.				
	(B) SAE ratings of lubricants				
	(C) Wankel engine				
	(D) Exhaust emission and its control				
	(E) Main functions of fuel supply system in CI engines.				
	(F) Main requirements of I C Engine fuels				

Re-exam Lab
[9:30]

BharatiyaVidyaBhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Re- Examination July 2019

Program: B. Tech Mechanical | **Duration: 3 Hour**

Course Code: PCC-BTM601 | **Maximum Points: 100**

Course Name: Refrigeration and Air-Conditioning. | **Semester: VI**

Instructions:

1) Question no.1 is compulsory and solve any four questions out of remaining six.
2) Use of refrigerant properties and psychrometric chart is permitted.
3) Use of steam table is permitted.
4) Assume suitable data and justify the same.

Q.No.	Questions	Points	CO	BL	PI
1(a)	Discuss effect of condenser pressure and evaporator pressure on performance of vapour compression cycle	5	1	1	1.4.1
1(b)	Differentiate between primary and secondary refrigerants by giving examples of each with its use.	5	3	2	1.4.1
1(C)	In a vapour-absorption refrigeration system, the refrigeration temperature is -15°C. The generator is operated by solar heat where the temperature is 110°C. The temperature of the heat sink is 55°C. What is the maximum possible COP of the system?	5	3	3	2.2.2
1(d)	Discuss about thermodynamic wet bulb temperature and wet bulb temperature.	5	3	2	1.4.1
2(a)	Draw neat sketch of reduced ambient aircraft refrigeration system and explain it in detail with T-s digram.	8	1	1	1.4.1
(b)	A R-134a vapour compression system operating at a condenser temperature of 40°C and evaporator temperature of 0°C develops 15 tons of refrigeration. Using p-h diagram for R-134a, determine (i) the discharge temperature and mass flow rate of the refrigerant circulated (ii) the theoretical piston displacement of the compressor and piston displacement per ton of refrigeration (iii) the theoretical horsepower of the compressor and horsepower per ton of refrigeration (iv) the heat rejected in the condenser and (v) the Carnot COP and actual COP of the cycle.	12	2	3	2.2.2
3(a)	Discuss in detail desirable properties to be possessed by a good refrigerant.	8	3	1	1.3.1
(b)	For a boot strap air refrigeration system for an aircraft flying at an altitude of 2000 m. The ram air temperature and pressure are 17°C and 1.08 bar respectively. The ambient conditions are being 80 kPa and 0°C. At the end of isentropic compression the air is at 4 bar and is cooled to 27°C using ram air. At this temperature air is	12	2	3	2.2.2

	further compressed in secondary compressor driven by cooling turbine. The air is then cooled in an auxiliary heat exchanger to 27°C and finally expanded to a cabin pressure of 1 atmosphere. Obtain the pressure at the exit of secondary compressor if air leaves the cabin at 25°C.				
4(a)	Explain the process of measuring wet bulb temperature of air. Also discuss how wet bulb temperature which is not a thermodynamic property can be considered as thermodynamic property.	10	3	2	1.3.1
(b)	The DBT and WBT of the air are 35°C and 23°C respectively. Find the followings if total air pressure is 1.00125 bar. Calculate following without using psychrometric chart. (i) Specific humidity (ii) Relative humidity (iii) DPT (iv) density (iv) Enthalpy.	10	3	2	2.1.2
5	The restaurant air conditioning plant consist of a fresh air intake, a cooling coil-followed by a mixing chamber for the cooled fresh air and recirculated room air, and a supply air fan before the restaurant room. The cooling coil handles all fresh air and has a BPF of 0.1. The ratio of fresh air to recirculated air is determined by modulating dampers. The other data is given below: Inside conditions: DBT = 24°C, RH = 50% Outside conditions: DBT = 30°C, WBT = 23.3°C Heat gains: RSH = 14.7 kW, RLH = 3kW Supply air quantity: 191 cmm Neglecting temperature changes in the fan and duct, determine the followings: (i) Temperature and moisture content of supply air. (ii) Mass flow rate of moist air supplied to room. (iii) DBT and moisture content of air leaving cooling coil. Load on the cooling coil.	20	4	4	2.4.1
6(b)	Discuss mechanism of body heat loss and explain mathematical model of heat exchange between man and environment.	10	3	2	1.3.1
(b)	What is three fluid refrigeration system? Explain it with neat sketch.	10	3	2	2.4.1
7(a)	Explain various types of duct design methods.	10	3	2	1.3.1
(b)	Name various types of supply air outlets and explain in detail general distribution pattern of various types of supply air outlets.	10	3	2	1.3.1

Lab 22/5/19 [9:30

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester May 2019 Examinations

Program: **T.Y .Mechanical Engineering** Duration: 3 Hour

Course Code: **MC- BT003** Maximum Points: 100

Course Name: **Health Safety and Environment** Semester: VI

Notes: 1.Questions number 01 is compulsory.
2. Solve any four main questions out of remaining six main questions.
3. Draw neat schematic diagrams wherever is necessary, **highlight** important points.
4. Assume suitable data if necessary and mention it.

Q.No.	Questions	Points	CO	BL	PI
Q1 A	Give definition of safety culture? Draw neat sketch of "Adaptation of Reason pathogen model"?	10	2	L4	3.2.1
B	Define 5 'S' and housekeeping.	10	1	L3	2.1.1
Q2 A	What are different major wetland types, give their examples also? Explain the following pointwise about wetlands a) Values, b) Functions?	10	2	L2	2.3.1
B	Explain about the accidents prevention tags at mechanical sites.	10	1	L3	1.2.1
Q3 A	With the help of neat sketch, Explain "Cycle of neglect" in developing countries. Give the OHS's Indian scenario in industrial sector?	10	4	L4	4.2.1
B	Write a short note on the risks connected with the following machine work. (i) Drilling machines (ii) Machines for cutting and slicing.	10	3	L2	1.2.2
Q4 A	What are the NSC requirements for safeguards? List down important points about Roles of Principals & non-school based department heads?	10	4	L2	4.2.2
B	What are the important points in carrying out workplace inspection? (10 marks)	10	3	L3	1.2.5
Q5 A	As per Global Strategy on occupational health, explain 10 high priority objectives of OHS?	10	4	L4	3.2.1

B	Describe in brief about types of pollution and its impact on environment.	10	2	L2	3.2.2
Q6 A	With the help of sketch explain in brief about elements involved in strategic environmental management plan?	10	3	L3	1.2.1
B	Describe about zoning related to noise and mention the acceptable noise level during day time and night time.	10	1	L2	2.2.2
Q7 A	Write short note on Convention on Biological Diversity (CBD)? Give important elements involved in "Framework for implementation of Ramsar Convention". Explain pointwise how conservation of wetland can be done to implement this convention?	10	3	L3	1.2.1
B	Discuss the issue of climate change and explain the major climate change protocols at global level.	10	4	L2	1.2.4