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B.E. (Mechanical) (Part - IV) (Semester - VIII)
Examination, November - 2019
INDUSTRIAL AUTOMATION ANDROBOTICS
(ELECTIVE - IV)
Sub. Code : 68518

Day and Date : Wednesday, 20 - 11 - 2019

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Make suitable assumption if necessary and mention them clearly.

- Q1) a)** With neat block diagram explain basic elements of an automated system. [8]
- b)** Explain the features and applications of the following [8]
- i) Flexible automation
 - ii) Programmable automation
 - iii) Fixed automation

OR

Explain the ten strategies for industrial automation and process development. [8]

- Q2) a)** Explain the following with respect to continuous control system. [8]
- i) Regulatory control
 - ii) Adaptive control
- b)** Explain analysis of transfer line without storage buffer. [8]
- Q3) a)** Explain the different types of vibratory and non vibratory part feeder mechanisms in automated assembly. [8]
- b)** Explain the four automated assembly system configurations. [10]

P.T.O.

- Q4) a) Explain following terms with respect to Robot - Spatial resolution, Load carrying capacity, Compliance, Precision of movement. [8]

OR

Explain factors to be considered in robot work cell design. [8]

- b) Explain the common robot configurations and their work volumes. [8]

- Q5) a) Explain following gripper mechanisms [8]

i) Magnetic grippers

ii) Vacuum grippers

- b) Direct and inverse kinematics solutions in robotics. [8]

- Q6) a) Explain a robot program as a path in space. [8]

- b) Explain the powered lead through and manual lead through programming methods in robot. [10]

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B.E. (Mechanical) (Semester - VIII)
Examination, November - 2019
ENERGY AND POWER ENGINEERING
Sub. Code : 68509

Day and Date : Thursday, 14 - 11 - 2019

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions : 1) All questions are compulsory.
 2) Figures to the right indicates full marks.

- Q1) a)** What are the potential renewable energy sources? State the advantages and disadvantages. [8]
- b)** Define following terms (any four) [8]
- i) Solar Constant
 - ii) Solar insolation
 - iii) Declination angle
 - iv) Hour angle
 - v) Azimuth
 - vi) Latitude

OR

- b)** State different types of solar collectors and its application [8]
- Q2) a)** Give different applications of PV Cells [4]
- b)** Give detail classification of fuel cells and its applications [10]
- c)** Differentiate between standalone and grid connected energy system [4]

P.T.O.

- Q3) a)** Compare vertical axis and horizontal axis wind turbine [8]
b) Define following terms (any four) [8]
 i) Cut Speed
 ii) Rated Speed
 iii) Betz Limit
 iv) Rotor Efficiency
 v) Cutout speed / furling speed
 vi) Capacity factor

- Q4) Answer any two** [16]
 a) Classify the hydro electric power plants and explain any one in detail.
 b) Describe the impact of co-generation plants in sugar industry on power scenario in Maharashtra.
 c) Explain gas turbine-steam turbine combined power plant.

- Q5) a)** Answer any two [12]
 i) Explain the magnetic wind method used for measurement of oxygen in flue gases.
 ii) Differentiate between peak load plants and base load plants.
 iii) Explain with sketch the following loads: domestic, commercial, industrial, municipal, irrigation, traction.
b) A generating station has the following daily load cycle: [8]

Time (Hours) :	0 - 6	6 - 10	10 - 12	12 - 16	16 - 20	20 - 24
Load (MW) :	40	50	60	50	70	40

Draw the load curve and find

- i) maximum demand ii) Units generated per day
 iii) average load and iv) load factor
- Q6) a)** Explain the process of energy audit in a commercial establishment. [8]
b) Discuss the issues of human resources in power sector. [6]

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B.E. (Mech.) (Part - IV) (Semester - VIII) (New) (CR)**Examination, November - 2019****MECHATRONICS****Sub. Code : 68508**

Day and Date : Wednesday, 13 - 11 - 2019

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Answer to all questions must be written in one answer book.
 - 3) Figure to the right indicate full marks to question.
 - 4) Assume any data if necessary and state it clearly.

Q1) Solve any two of the following:

- a) Suggest a suitable sensor for sensing following quantities; also state the transduction principle of sensor suggested by you. [8]
 - i) Mass
 - ii) Cryogenic Temperature
 - iii) I.C. engine exhaust
 - iv) Blood Pressure
- b) List sensors used in smart Phone and Explain any two. [8]
- c) Explain Digital to Analog converters (DAC) signal conditioning process. [8]

Q2) Solve any two of the following.

- a) What is Interfacing? Explain following w.r.to. [8]
 - i) Series Interfacing.
 - ii) Parallel Interfacing.
- b) List operational amplifier, Explain Op Amp. Used in domestic Inverter. [8]
- c) Discuss role of Multiplexer in Data Acquisition system. [8]

P.T.O.

Q3) Solve any two of the following.

- a) What are flip flop circuits? Explain D flip flop. [8]
- b) Carry out Addition ($27 + 5$), Subtraction ($73 - 15$), Multiplication (37×3) and Division ($295/7$) For Two decimal Numbers in Binary numbers. [8]
- c) Discuss Instruction type and set, Addressing modes Microcontroller MCS 51. [8]

Q4) Solve any two of the following.

- a) Explain Internal relays and holding contacts with ladder programming diagrams. [8]
- b) Explain with neat sketch, ladder programme Traffic Lights Control signal system for four roads. [8]
- c) Discuss Mechatronics design of an automatic car park system [8]

Q5) a) Differentiate Traditional Vs Mechatronic design and its impact on real life. [8]

- b) Design the program for a pneumatic system for control by a PLC to give the cylinder sequence A+, B+, B-, A- and which will give a LED display indicating, in the presence of a fault such as a sticking cylinder, at which point in the cycle the fault occurred. Explain the action of all elements in the system. [12]

Q6) Solve any two of the following.

- a) This problem is essentially part of the domestic washing machine program. Devise a ladder program to switch on a pump for 100s. It is then to be switched off and a heater switched on for 50s. Then the heater is switched off and another pump is used to empty the water. [8]
- b) With the help of suitable block diagram, explain simple assembly task involving a five parts. [8]
- c) Write a note on PLC timer function with example. [8]



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$$(A) = 11t^2, I_{xx} = \left(\frac{419}{12}\right)t^4 \text{ and } y = \left(\frac{5t}{2}\right) \quad [8]$$

- 26) a) What is adequate design and Optimum design? Explain with suitable examples? [8]

OR

- b) Explain various parameters in design of machine Elements. [8]
- b) A thin spherical pressure vessel is subjected to an internal pressure of 5 N/mm². The mass of the empty vessel should not exceed 150kg. If the factor safety based on yield strength is 2.0. Design the pressure vessel with the objective of maximizing the gas storage. [8]

Sr.No.	Material	Tensile Yield Strength S_{yt} , N/mm ²	Mass Density (ρ) Kg/m ³
01	Alloy steel-15Cr90 Mo55	450	7800
02	Aluminum Alloy-74530	150	2800
03	Titanium Alloy	800	4500
04	Magnesium Alloy	100	1800

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B.E. (Mechanical) (Part - IV) (Semester - VII) (New)

Examination, November - 2019

MECHANICAL SYSTEM DESIGN

Sub. Code : 67502

Day and Date : Tuesday, 26 - 11 - 2019

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Assume suitable data wherever necessary and state it clearly.
 - 3) Draw neat labeled sketches wherever necessary.

- Q1) a) Explain Aspects of aesthetic design with suitable examples. [8]
- b) Explain ergonomic consideration in design of displays and controls. [8]

OR

- b) With suitable example explain the creativity concept in the product design. [8]

- Q2) a) Derive Clavarino's Equation to determine the thickness of pressure vessels [6]

OR

Explain the different types of supports used for pressure vessels. [6]

- b) A pressure vessel of 300mm inner diameter subjected to an internal Pressure of 25 Mpa. The cylinder material is plain carbon steel 15C8 having ultimate strength 440N/mm², yield strength 240 N/mm² and Poisson's ratio ($\mu = 0.29$). Determine the thickness of cylinder wall based on:
- i) Maximum principal stress theory.
 - ii) Maximum principal strain theory.
 - iii) Maximum shear stress theory.
 - iv) Distortion energy theory.

Take factor of safety based on the yield strength as 1.5

[12]

P.T.O.

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- Q3) a) Discuss various types of friction lining materials used in clutches. What are the desirable properties of friction material. [8]
- b) A leather faced cone clutch transmits power at 500 rpm. the semi-cone angle α is 12.5° . The mean diameter of the clutch is 300 mm, while the face width of the contacting surface of the friction lining is 100mm. The co-efficient of friction is 0.2 and the maximum intensity of pressure is limited to 0.07 N/mm^2 . Calculate the force to engage the clutch and the power transmitting capacity. [8]

OR

- b) An automotive type internal expanding brake is as shown in figure 1. The face width of friction lining is 50mm and the coefficient of friction is 0.4. The maximum intensity of pressure on the lining is 0.8 N/mm^2 . The angle θ_1 can be assumed to be zero. Calculate: [8]
- The actuating force.
 - The Braking Torque Capacity.

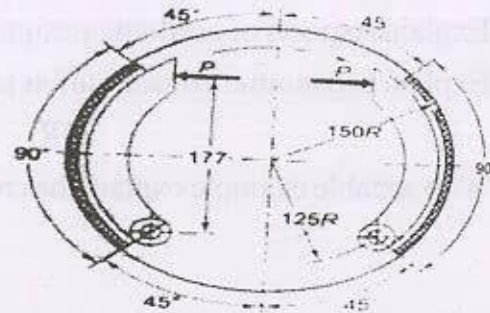


Fig. 1

- Q4) a) Explain the advantages of geometrical progression for selecting the speed steps of a multi speed machine tool gear box. [6]

OR

State the difference b/w structural and speed diagram of a Machine tool gear box. [6]

- b) A multi speed gear box is to be designed for a headstock of a turret lathe for nine spindle speeds ranging from 60 rpm to 2880 rpm. If the gear box is driven by 5KW, 1440 rpm electric motor;
- Draw the speed ray diagram.
 - Draw the gearing diagram.
 - Determine the number of teeth on gears. [12]

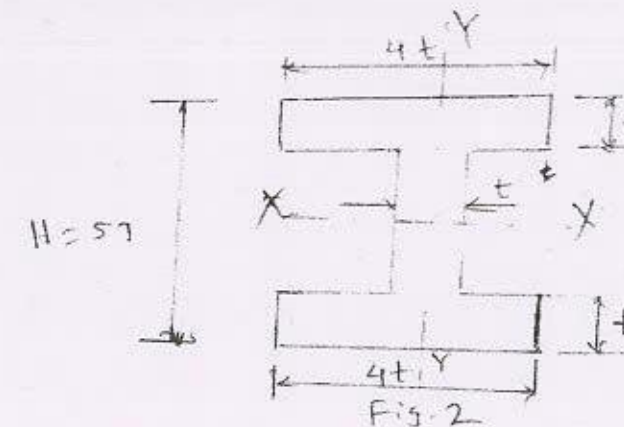
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- Q5) a) Explain design considerations of piston barrel and piston skirt with neat sketch. [8]
- b) The cylinder of a four stroke diesel engine as the following specifications
- Brake power = 3.75 kW.
- Speed = 1000 rpm.
- Indicated Mean Effect Pressure = 0.35 Mpa.
- Mechanical Efficiency = 80%
- Determine the bore and length of the cylinder linear. [8]

OR

- b) The following data is given for a connecting rod:
- Engine speed = 1800 rpm.
- Length of connecting rod = 350mm.
- Length of stroke = 175 mm.
- Density of material = 7800 kg/m^3
- Thickness of web or flanges = 8 mm

Assume the cross-section of the connecting rod as shown in Fig.2 for which Area of cross section



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B.E. (Mechanical) (Part - IV) (Semester - VII) (Revised)
Examination, November - 2019
REFRIGERATION & AIR CONDITIONING
Sub. Code : 67501

Day and Date : Saturday, 23 - 11 - 2019

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) Attempt all questions.
 - 2) Neat diagrams must be drawn wherever necessary.
 - 3) Make suitable assumptions if necessary and state it clearly.
 - 4) Use of calculator, steam table Psychrometric table and chart is allowed.

- Q1) a) Derive an expression for performance of Reversed Carnot refrigeration cycle with the help of P-V and T-S diagrams. [8]

OR

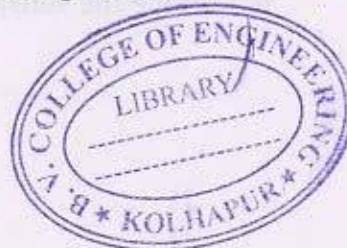
With neat diagram explain the working of simple air craft cooling cycle.

- b) i) Give the comparison between heat engine and refrigerator.
- ii) A Carnot refrigerator requires 1.3KW of power per ton of refrigeration to maintain space at -44°C . Determine the cop of refrigerator and heat rejected in kw per ton. [8]
- Q2) a) Draw Cascade system on P-h diagram and TS plots with schematic diagram explain the system. [8]

OR

Explain with neat sketches,

- i) Wet versus dry compression
- ii) Throttling versus isentropic Expansion



P.T.O.

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- b) 32000kg of ice per day is produced from at 0 °C in an ammonia ice plant working on vapor compression cycle. The temperature range of the cycle is -15°C to 25 °C. The vapor at the end of compression is dry saturated. Find. [10]

- i) Cop
- ii) Refrigeration effect
- iii) Mass flow rate of refrigerant in kg/s and
- iv) Power required to drive the plant.

Take latent heat of ice = 335kJ/kg

- 23) a) Write notes on

- i) Secondary refrigerants
- ii) Ice plant
- iii) cold storage

OR

List selection criteria for following equipments for system.

- i) Compressor
- ii) Condenser
- iii) Evaporator

- b) Suggest the proper reasons, the types of refrigerants used for following applications. [7]

- i) Domestic refrigeration
- ii) Ice cream plant
- iii) cold storage
- iv) Room air refrigeration

- 24) a) What is moist air? Derive an expression for the enthalpy of moist air. [8]

OR

Explain clearly the different stages of human body defence against variations of weather conditions during summer and winter.

- b) Atmospheric air at 16°C DBT & 25% RH passes through a furnace and then through a humidifier, in such a way that the final condition is 30°C DBT & 50% RH. Find the heat and moisture added to the air. Also determine the sensible heat factor of the process. [8]

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- Q5) a) Explain with the help of neat sketch ERSHF, RSHF. [6]

OR

Explain with neat sketches summer and year-round air conditioning systems.

- b) The following data refers to summer A/C of a building. [12]

Outside design condition = 43°C DBT, 27°C WBT

Inside design condition = 25°C DBT, 50%RH

Room sensible heat gain = 84000 kJ/h

Room latent heat gain = 21000 kJ/h

By-pass factor of the cooling coil used = 0.2

The return air from the room is mixed with the outside air before entry to cooling coil in the ratio of 4:1 by mass. Determine

- i) ADP of the cooling coil
- ii) Entering and leaving conditions of air for cooling coil.
- iii) Fresh air mass flow rate
- iv) Refrigeration load on the cooling coil.

- Q6) a) Explain the following methods of duct design [8]

- i) Static regain method.
- ii) Velocity reduction method

OR

Explain dynamic losses in ducts (Atleast four) [8]

- b) Explain the concept of Green building.



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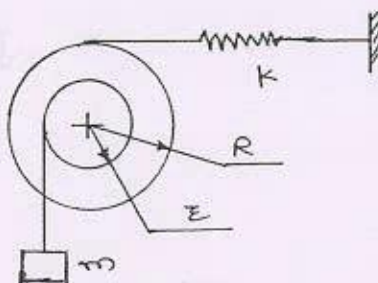
B.E. (Mech.) (Part - IV) (Semester - VIII) (Revised)
Examination, November - 2019
NOISE AND VIBRATION
Sub. Code : 68510

Day and Date : Friday, 15 - 11 - 2019
Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 100

- Instructions :
- 1) All questions are compulsory.
 - 2) Assume suitable data wherever necessary.
 - 3) Draw neat sketches wherever necessary.

- Q1) a)** What is vibration? How vibrations are classified? [8]
b) Find the natural frequency of system shown in figure considering mass of pulley. [8]



OR

A vibrating system is defined by following parameters;

$m = 3\text{kg}$, $k = 100\text{ N/m}$, $c = 3\text{ N-s/m}$

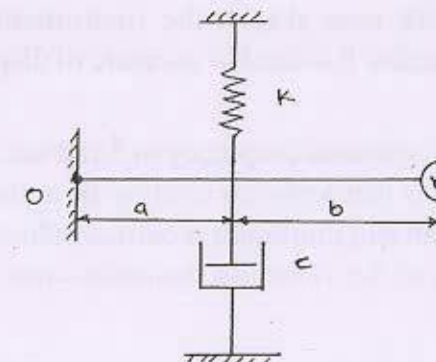
Determine:

- i) The damping factor
- ii) The natural frequency of Damped vibrations
- iii) Logarithmic Decrement
- iv) The ratio of two consecutive amplitudes and
- v) The number of cycles after which the original amplitude is reduced to 20%

P.T.O.

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- Q2) a)** Explain Magnification factor and its frequency response curve. [8]
b) Derive the equation of motion for system shown in figure. Also determine the equation for critical damping coefficient. [10]



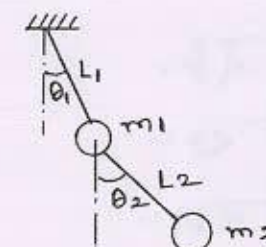
- Q3) a)** Explain co ordinate coupling. [8]

OR

With neat sketch explain Centrifugal Pendulum Absorber. [8]

- b)** Determine the natural frequency of oscillation of the double pendulum as shown in figure. [8]

Take $m_1 = m_2 = 5\text{ kg}$, $L_1 = L_2 = 0.25\text{m}$.



- Q4) a)** Explain Flexibility influence coefficient matrix, and stiffness influence coefficient matrix. [8]

OR

Derive the equation of motion for multi degree spring mass system. [8]

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- b) Using Holzer's method, find the natural frequencies of the system shown in fig. 4b. Assume $m_1 = m_2 = m_3 = 1 \text{ kg}$ and $k_1 = k_2 = k_3 = 1 \text{ N/m}$. Solve up to four iterations. [10]
- Q5) a) Explain in brief with neat sketch the instruments Accelerometer, Vibrometer. State whether it is used to measure of displacement, velocity and/or frequency. [8]
- b) A vibrometer having a natural frequency of 5 rad/sec and ξ (Zeta) = 0.25 is attached to a structure that performs a harmonic motion. If the difference between the maximum and minimum recorded values is 10 mm , find the amplitude of motion of the vibrating structure when its frequency is 50 rad/sec . [8]
- Q6) Attempt any two [16]
- a) Define the following terms : Sound pressure level, Sound power level, Sound intensity level and explain why we should need decibel sound level scale.
- b) Show that as the distance from a point source doubles, the sound intensity level increases by 6 dB ?
- c) Explain non-auditory effects of noise on people.

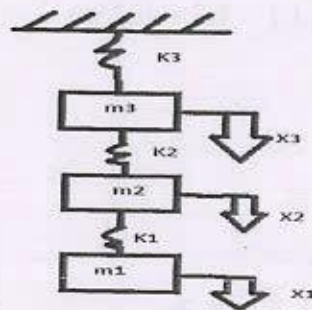


Fig.4b

x x x