

SV-103

Total No. of Pages : 2

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B.E. (Mechanical Engineering) (Semester - VII)
Examination, May -2019
TOTAL QUALITY MANAGEMENT (Elective - II)
Sub. Code : 67833

Day and Date : Thursday, 09 - 05 - 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 assumptions wherever necessary and state them clearly.
 - 4) Use of statistical tables and scientific calculator is permitted.

Q1) Solve any two.

- a) Explain process approach. How it forms basis of ISQ Quality Management System? [8]
- b) Design customer feedback form for a Restaurant. [8]
- c) Defects result in customer dissatisfaction. How we can plan for defect free products? [8]

Q2) Solve any three.

- a) What are the stages of quality planning while developing new product? [6]
- b) Suggest parameters and their weightage for vendor rating. [6]
- c) Measurement of process capability leads to a no. of conclusions. Elaborate few. [6]
- d) DPMO in Six Sigma represents opportunities for improvements. How? [6]

Q3) Solve any two.

- a) Explain FEMA technique in details with concept and its applications. [8]
- b) Orthogonal arrays are applied in which technique? What inferences one can draw from them? [8]

P.T.O.

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- c) What is the effect of component reliability in parallel configuration? How system reliability will vary for combinations of components' reliability? Consider a system Consisting of three subsystems arranged reliability-wise in parallel. Subsystem 1 has a reliability of 91.5%, Subsystem 2 has a reliability of 97.7% and Subsystem 3 has a reliability of 94.6% for a mission of 100 hours. What is the overall reliability of the system for a 100-hour mission? [8]

Q4) Solve any two.

- a) Deming devised a cycle for continual improvement. Highlight it's working. [8]
- b) Juran came up with trilogy leading to effective Quality. What are the salient features of this trilogy? [8]
- c) How to achieve manufacturing excellence using Schonberger's action agenda? [8]

Q5) Solve any three.

- a) What is the basis of customer perception about product / service quality? [6]
- b) Retention of existing customers is easier than getting new customers. Comment. [6]
- c) Design one day training program for "TQM Awareness" for top management. Decide course contents, medium of instructions and methodology. [6]
- d) What is the difference between continuous and continual improvements? Explain with suitable examples. [6]

Q6) Solve any two.

- a) What problems are encountered while defining service quality? What are its common attributes? [8]
- b) Discuss eight quality management principles on which ISO: 9001:2008 is based. [8]
- c) Discuss the benefits of ISO/TS standard for an organization. [8]



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B.E (Mechanical) (Part - IV) (Semester - VII) (Revised)**Examination, May -2019****AUTOMOBILE ENGINEERING (Elective - I)****Sub. Code : 67506****Day and Date : Tuesday, 07 - 05 - 2019****Total Marks : 100****Time : 2.30 p.m. to 5.30 p.m.**

- Instructions :**
- 1) All questions are compulsory.
 - 2) Draw neat sketches wherever necessary.
 - 3) Figures to the right indicate full marks.
 - 4) Make suitable assumptions if necessary.
 - 5) Use of non-programmable calculator is allowed.

Q1) a) Explain with neat sketch front engine rear wheel drive layout and write its advantages and disadvantages. [8]

b) Explain in detail the automobile body construction and write different materials used for automobiles. [8]

Q2) a) Write various requirements of an automobile clutch. Explain with neat sketch multiplate clutch. [9]

b) Discuss with neat sketch construction and working of differential. [8]

OR

Explain with sketch operation of synchromesh unit. [8]

Q3) a) What are advantages of power steering. Explain with sketch integral power steering system. [9]

b) Write requirements of automobile suspension system. Explain the working principle of hydraulic shock absorber. [8]

OR

Which are the different types of independent suspension system? Explain any one of them with neat sketch. [8]

P.T.O.

- Q4) a) Compare Disc type and Drum type brakes on the basis of performance, efficiency, life and heat dissipation. [8]
- b) Explain with neat sketch working of Tandem Master Cylinder. Also explain Split braking system for medium duty vehicles. [8]

OR

Compare with neat sketch Tubed tyre and Tubeless tyre. List desirable tyre properties. [8]

- Q5) a) Explain the construction and working of lead acid battery. What are the different tests carried out to check the performance of battery? [8]
- b) Draw refrigeration system for car air conditioning and explain working. [8]

OR

Draw a layout sketch of electronic controlled management system used in vehicles. List the sensors used. [8]

- Q6) a) The coefficient of rolling resistance for a truck weighing 62293.5 Newton is 0.018 and coefficient of air resistance is 0.0276 in the formula $R = K.W + K_a.A.V^2$. The transmission efficiency in top gear of 6.2:1 is 90% and that in the IInd gear of 15:1 is 80%. The frontal area is 5.574 m². If the truck has to have a maximum speed of 88 Km/hr in top gear, Calculate:- [12]

- the engine b.p. required.
 - the engine speed if the driving wheels have an effective diameter of 0.8125 m.
 - the maximum grade the truck can negotiate at the above engine speed in IInd gear.
 - the maximum draw bar pull available on the level road at the above engine speed in IInd gear.
- b) Explain the following terms: [6]
- Traction and Tractive effort
 - Gradiability
 - Draw bar pull

OR

List and explain the various resistances to vehicle motion. [6]

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B.E.(Mechanical) (Part - IV) (Semester - VIII)

Examination, May - 2019

INDUSTRIAL AUTOMATION AND ROBOTICS (Elective - IV)

Sub. Code : 68518

Day and Date : Friday, 24 - 05 - 2019

Total Marks : 100

Time : 10.00 a.m. to 1.00 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) Explain three phases of typical automation migration strategy. [8]

b) Discuss with an appropriate example the concept of levels of automation. [8]

Q2) a) Explain any two linear transfer systems in automated production lines. [8]

b) Explain analysis of transfer line with storage buffer. [8]

Q3) a) Explain the concept of product design for automated assembly. [8]

OR

a) Explain part delivery system in automated assembly line. [8]

b) Explain various vibratory and non - vibratory devices for feeding and orientation. [10]

P.T.O.

Q4) a) Explain the common robot configurations and their work volumes. [8]

b) Explain different joints and their degree of freedom in robot system. [8]

Q5) a) Explain direct and inverse kinematics solutions in robotics. [8]

b) Explain the remote center compliance (RCC) device in robot assembly. [8]

Q6) a) Explain applications of Robot. [8]

b) Explain WAIT, SIGNAL and DELAY commands in industrial robot. [10]



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B.E. (Mech.) (Semester - VIII) Examination, May- 2019

ENERGY & POWER ENGINEERING

Sub. Code: 68509

Day and Date : Thursday, 16 - 05 - 2019

Total Marks : 100

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

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figure to the right indicate full marks to question.

- Q1) a)** Explain types of Solar Collectors with examples. **[10]**
b) Define the following. **[8]**
- i) Altitude Angle
 - ii) Incident Angle
 - iii) Hour Angle
 - iv) Declination Angle

OR

Classify the methods of Solar energy storage. Explain any one types of sensible heat storage system. **[8]**

- Q2) a)** Explain working of Solar PV System with sketch both ongrid and offgrid system. **[8]**
b) Explain with neat sketch working of fuel cell list advantages of the fuel cell. **[8]**

OR

List types of fuel cells and applications of fuel cell. **[8]**

- Q3) a)** Explain main consideration in relation of site for wind energy conversion system. State advantages and disadvantages of wind energy. **[8]**
b) Explain working of OTEC with neat sketch. **[8]**

OR

Explain any one Hybrid System with neat sketch. **[8]**

P.T.O.

Q4) Answer any two.

[16]

- a) Explain with neat sketch, the working principle of nuclear power plant.
- b) Explain the power generation in private sector with respect to capacity, method of power generation, location and future expansion.
- c) Explain how the combined cycle plant can maximise the utilisation of power plant under varying load.

Q5) a) Answer any two.

[12]

- i) Explain the various tariff methods.
- ii) Explain with a sketch the radiation detector.
- iii) Explain the working of PH meter fuel analyser.
- b) Two electrical units used for same purpose are compared for the economical working:
 - i) Cost of first unit is Rs. 5000 and it consumes 100kW.
 - ii) Cost of second unit is 14000 and it consumes 60 kW.

Each of them has a useful life of 40000 hours. Which unit will prove economical if the energy is charged at Rs.80 per kW of maximum demand per year and 5 paise per kW-hr? Assume both units run at full load. [8]

Q6) a) Describe the supply chain in power sector in India. [8]

b) Explain the process of energy audit in a foundry. [6]



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B.E. (Mech.) (Part - IV) (Semester - VIII) (New)

Examination, May- 2019

MECHATRONICS

Sub. Code: 68508

Day and Date : Tuesday, 14 - 05 - 2019

Total Marks : 100

Time : 10.00 a.m. to 1.00 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) What do understand by multidiscipline scenario? Explain the same. [8]
- b) Discuss with neat sketch proximity sensor. [8]
- c) List displacement Sensors and explain LVDT. [8]

Q2) Solve any two of the following.

- a) What do you mean by filtering? Discuss any two filters? [8]
- b) What is interfacing? List requirements of interfacing. [8]
- c) Explain sample and hold circuit. [8]

Q3) Solve any two of the following.

- a) What do you understand by means of digital logic? Explain Sequential Logic. [8]
- b) Explain organization of microcontroller System. [8]
- c) Convert following decimal number to Hexadecimal numbers. [8]
1.234 2.3562 3.0.14 4.6768.

Q4) Solve any two of the following.

- a) Differentiate physical and Programming Components in case of PLC and discuss merits and demerits. [8]
- b) Discuss Machine control terminology. [8]
- c) Explain PLC Timer functions with application. [8]

P.T.O.

- Q5) a) Discuss any two input devices and any two output devices in PLC. [8]
- b) Develop a programmable ladder logic diagram for detecting, Sorting and packaging unit, list input and output Devices used in circuit. Ref. Figure 5B. [12]
- Sense component
 - Sort component for rejection and acceptance
 - Open acceptance flapper.
 - Send component for packaging.

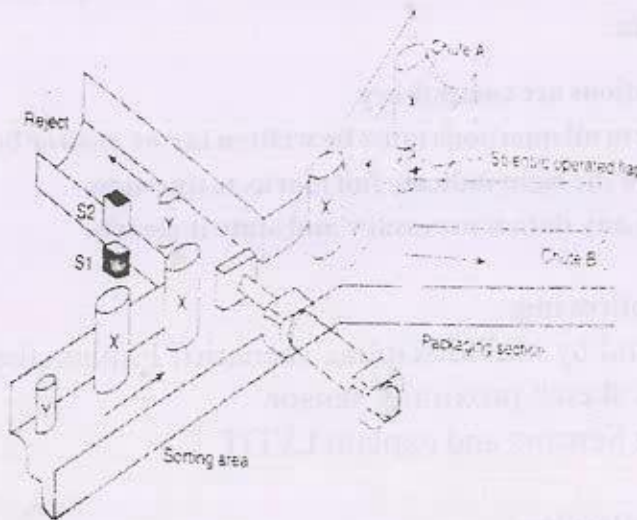


Figure 5B

DETECTING, SORTING AND PACKAGING UNIT

Q6) Solve any two of the following.

- Discuss Mechatronics System design for automatic tool and pallet changers. [8]
- Discuss steps involved in writing ladder diagram for large process. [8]
- Device ladder programs for systems that will carry out the following tasks. [8]
 - Switch on a pump when the water level in a tank rises above 1.2m and switch it off when it falls below 1.0m.
 - Switch on a pump, then 100s later switch on a heater, then a further 30s later switch on the circulating motor.



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B.E. (Mechanical) (Semester - VII) (Revised)

Examination, May -2019

FINITE ELEMENT ANALYSIS

Sub. Code : 67503

Day and Date : Saturday, 4 - 05 - 2019

Total Marks : 100

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

- Instructions :
- 1) All questions are compulsory.
 - 2) Assume suitable data if necessary and state it clearly.
 - 3) Figures to the right indicate full marks.

Q1) Attempt any two.

- a) Evolution of FEA & its importance in present industrial practices. [8]
- b) Explain the principle of minimum potential energy with an example. [8]
- c) Explain the different steps involved in FEA. [8]
- d) Discuss about Von-Mises stress. [8]

Q2) a) For the spring system shown in fig-2a, $K_1 = 300 \text{ N/mm}$, $K_2 = 600 \text{ N/mm}$ & $K_3 = 300 \text{ N/mm}$ force applied at node 3, $P = 400 \text{ N}$. Calculate. [10]

- i) Nodal displacement
- ii) Global stiffness matrix
- iii) Reaction forces
- iv) Force in spring2.

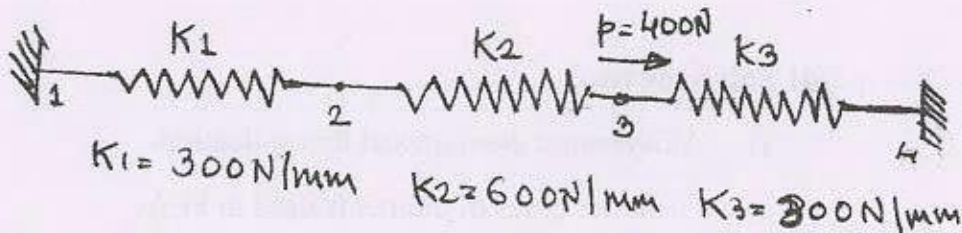


Fig.2a

P.T.O.

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- b) What are the important properties of shape function. Show and explain the variations of shape function for quadratic element. [6]

OR

- c) Compare Analytical, Numerical & Experimental method used for solving the engineering problems. [6]

- Q3) a) A four bar plane truss is shown in fig 3-a. cross section area for each member is 400 mm^2 & $E = 200 \text{ GPa}$. Prepare the global matrix by applying boundary conditions & load.

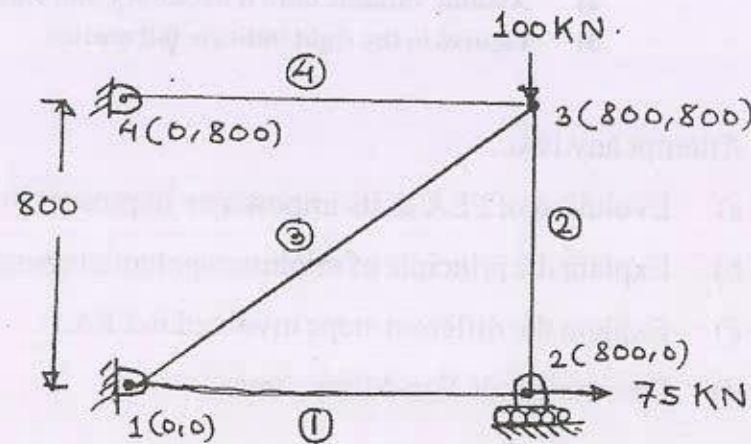


Fig. 3a

Value of E for each member = 200 GPa .

Cross set. area for each member = 400 mm^2

- b) Write a short note on isoparametric element. [14]

OR

- c) Nodes & Element numbering. [4]

Q4) Solve any two:

- a) Axisymmetric element and its application. [8]
 b) Different types of elements used in FEA. [8]
 c) What is the effect of size and number of elements on accuracy of the problem explain with suitable example. [8]

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- Q5) a) A composite wall consists of three materials is shown in figure 5 - a. The outer temp is $T_o = 35^\circ\text{C}$. Convection heat transfer takes place on the inner surface of the wall with $T_\infty = 500^\circ\text{C}$ & $h = 40 \text{ W/m}^2\text{C}$ Determine temp. Distribution in the wall. [10]

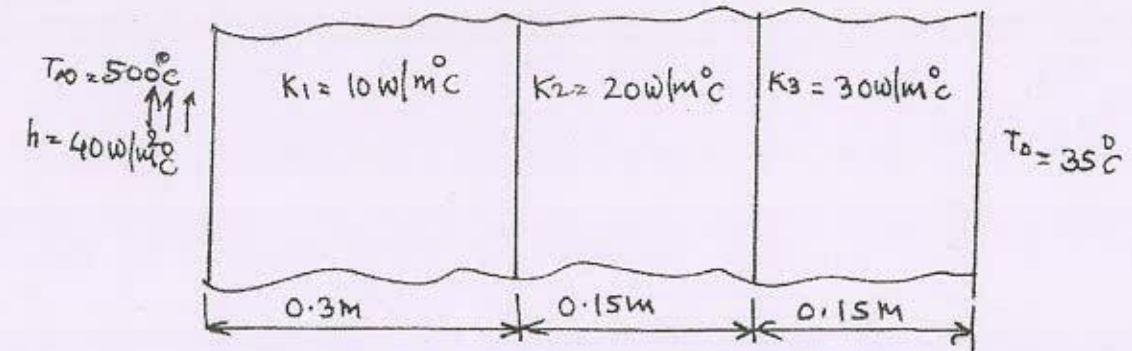


Fig.5a

A composite wall with three materials.

- b) Discuss the types of problems solved by FEA. [6]

OR

- c) Discuss element shape & distortion. [6]

Q6) Solve any three.

- a) Simplex and higher order elements.
 b) Elimination & penalty method.
 c) Simplification through different symmetry.
 d) Geometrical approximations used in FEA.
 e) Interpretation of results & Validation.
 f) Meshing techniques.



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Total No. of Pages : 4

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3.E. (Mechanical) (Semester - VII) (New) Examination, May - 2019

MECHANICAL SYSTEM DESIGN

Sub. Code : 67502

Day and Date : Thursday, 02 - 05 - 2019.

Total Marks : 100

Time : 02.30 p.m. to 5.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Assume suitable data wherever necessary.
 - 3) Use of Non-Programmable calculator is allowed.
 - 4) Figure to the right indicate full marks.

- 11) a) Explain the various aesthetic considerations in the product design of motor cycle clearly indicating how the present design has evolved over the years. [8]
- b) What is creativity? What is its significance in design process? Explain with examples. [8]

OR

Explain various displays and controls of a CNC lathe. Describe how they should be placed in ergonomic manner.

- 22) a) Explain in a step wise manner the procedure to determine the tangential and radial stresses in a compound cylinder subjected to internal pressure. [8]

OR

Explain clearly with neat sketches the various types of end closures used in pressure vessels. Write their relative merits and demerits. Write the design equations for Torispherical end closure and hemispherical end closure.

- b) A cylindrical pressure vessel having inside diameter 1800 mm is subjected to an internal working pressure of 2.5 N/mm^2 . Both the shell as well as the end closures is made from IS 2041- 1962 having yield strength of 290 N/mm^2 . Weld joint efficiency may be taken as 90% Factor of safety is 1.5 Corrosion allowance is 2 mm. Determine the thickness of the shell and the thickness of the head if the heads are. [10]
- i) Semi elliptical
 - ii) hemispherical
 - iii) Torispherical with a crown radius of 1750 mm.

P.T.O.

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- 16) a) Explain with the example what do you mean by adequate and optimum design. [6]

OR

Discuss various parameters involve in the optimum design of mechanical elements.

- b) Design a tensile bar of length of 200mm to carry a tensile load of 5kN for minimum cost out of following materials. [10]

Material	Mass Density (kg/m^3)	Material Cost (Rs./N weight)	Yield Strength (Mpa)
Steel	7500	16	130
Al-Alloy	3000	32	50
Titanium			
Alloy	4800	280	90
Magnesium			
Alloy	2100	32	20



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- b) Three stages, 12 speed gear box is to be designed for spindle speeds varying between 60 to 2880rpm. the gear box is driven by 5 kw, 1440rpm motor. The second stage is 3 speed steps.

- Draw structure/speed/ray diagram.
- Draw gearing diagram
- Determine no. of teeth on gears for the first stage only.
- Select pulley diameter for belt drive.

The standard pulley diameters are: 80, 90, 100, 112, 125, 140, 160, 180, 200, 224, 250, 280, 290, 300, 310, 355, 375, 400, 450, 500 mm. Assume same module for all gears. [12]

- 25) a) Discusses the criterions for the calculations of thickness of piston head. [6]

- b) Determine the cross section of I-section fo connecting rod for a single cylinder I.C. Engine. [10]

Use the following data for engine :

Piston diameter = 100mm,

Length of connecting rod = 300mm, Stroke length = 125 mm, speed = 1500rpm,

Maximum explosion pressure = 3.5 N/mm^2 , Factor of safety = 7.

Yield stress in compression = 330 Mpa

Assume width of section as $4t$ and depth $5t$, where t is the web thickness of I-section.

OR

following data refers to connecting rod of diesel engine :

Engine speed = 1800 rpm, Length of connecting rod = 350 mm,

Mass of reciprocating parts = 2.5kg, Length of crank pin = 76mm, obliquity ratio = 5.

Diameter of crank pin = 58mm, Thickness of bearing bush = 3 mm,

Distance between bolt centers of bearing cap = 1.8 times Diameter of crank pin,

Permissible tensile stress for bolts = 60 N/mm^2 , permissible bending stress for cap = 80 N/mm^2 . Determine :

- The nominal diameter of bolt.
- The thickness of bearing cap for the big end.

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- 23) a) Explain with neat sketches self-engineering, self-locking and uncontrolled breaking (grabbing) conditions in external block brake with short shoe. [8]

- b) A multi plate clutch has three discs on the driving shaft and two discs on the driven shaft. The outside diameter of the contact surface is 240 mm and inside diameter is 120 mm. Assuming uniform pressure and coefficient of friction $\mu = 0.3$, find the total spring load pressing the plates together to transmit 25 kW at 1575 rpm. If there are 6 springs each having a stiffness 13 kN/m and each of the contacting surfaces has worn away by 1.25 mm, find the maximum power that can be transmitted. Assume uniform wear. [8]

OR

Refer to the simple band brake shown in figure 1 and calculate

- Band tension tight and loose sides,
- Actuating force and
- Torque capacity of the brake. Assume that $a = 250 \text{ mm}$, $l = 750 \text{ mm}$, $\theta = 225^\circ$, $R = 250 \text{ mm}$, width of the friction lining = 60 mm, maximum intensity of pressure = 0.25 N/mm^2 and coefficient of friction $\mu = 0.4$. [8]

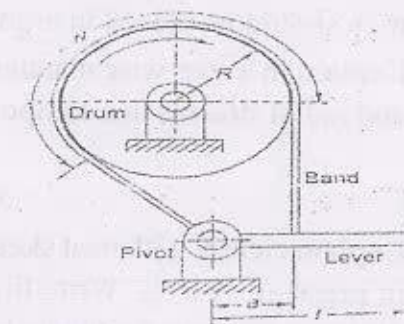


Figure 1 Question 3

- Q4) a) Explain briefly compound ray diagram of a multi speed machine tool gear box. [6]

OR

What do you understand by maximum loss of economic cutting speed. Derive the expression for the same.

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B.E. (Mechanical) (Part - IV) (Semester - VIII) (Revised)

Examination, May -2019

INDUSTRIAL ENGINEERING (Elective - III)

Sub. Code : 68511

Day and Date : Wednesday, 22 - 05 - 2019

Total Marks : 100

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

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Draw a neat-labelled diagrams wherever necessary.
 - 4) Assume suitable data, if necessary.

Q1) Attempt any Three.

- a) Explain characteristics of continuous production system. [6]
- b) Comment "Increase in production may or may not increase in productivity". [6]
- c) What do you mean by productivity? How does it differ from efficiency & effectiveness. [6]
- d) Comparative study of a automobile components for the year 2017 and 2018 are given in the table below. Compute the changes in labour productivity. [6]

Particulars	2017	2018
Output (in Units)	60,000	80,000
Labour input (In Rs.)	12,000	14,000

Q2) Attempt any four.

- a) How is job selected for method study? [4]
- b) Define work study. What are components of work study? [4]
- c) Explain construction and application of flow process chart with suitable example. [4]
- d) Draw two handed process chart for filling a fountain pen. [4]
- e) Compare flow diagram and string diagram and state the application of each? [4]

P.T.O.

i) Attempt any two.

- a) State examples of principles of motion economy as related to work place layout. [8]
- b) Give the name, abbreviation and symbol of any 8 Therbligs. [8]
- c) Discuss various factors related to work environment. [8]

ii) Attempt any three

- a) Explain the following terms [6]
 - i) Rating
 - ii) Time study equipments
- b) In the following table, times shown are stopwatch readings in minutes. Initial setting of stopwatch is at 0.00. [6]

Elements	Cycle time (in minutes)				Performance rating in %
	1	2	3	4	
A	3.6	3.8	3.4	3.6	105
B	7	7.2	7.4	7	90
C	5	5.2	5.4	5.6	110
D	12.2	12.4	12	12.4	100
E	8.4	8.2	8.6	8.6	115

Relaxation allowance as 15%. Estimate the standard time of operations and production per 8 hours of shift.

- c) Discuss the need for various allowances in determining the standard time? [6]
- d) Describe Principles and techniques of work measurement and their applications? [6]

5) Attempt any two

- a) Name and discuss the factors which you need to consider for the selection of site of sugar industry. [8]
- b) Explain the tools and techniques of layout planning. [8]
- c) Which type of layout do you recommend for a manufacturing flywheels used in automobiles? Give reasons. [8]

6) Write short notes on any four.

- a) Phases in value analysis [4]
- b) Value analysis of a bicycle [4]
- c) Benefits of merit rating [4]
- d) Job analysis [4]
- e) Job specification for foundry supervisor [4]

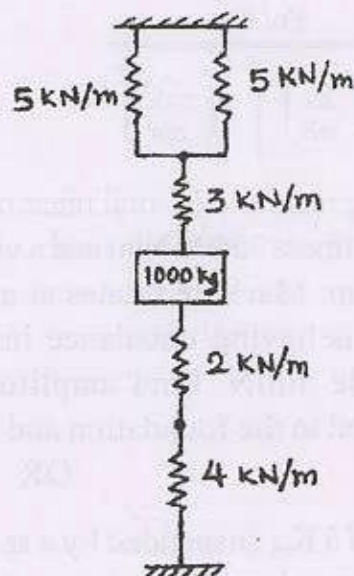
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B.E. (Mechanical) (Part - IV) (Semester - VIII)**Examination, May - 2019****NOISE AND VIBRATION****Sub. Code: 68510****Day and Date : Monday, 20 - 05 - 2019****Total Marks : 100****Time : 10.00 a.m. to 1.00 p.m.**

- Instructions :**
- 1) All questions are compulsory.
 - 2) Use of scientific calculator is allowed.
 - 3) Assume suitable data wherever necessary and mention it clearly.
 - 4) Figures to the right indicate full marks.

- Q1) a)** What are the different causes of vibration in machines? What are the effects of the vibration? [8]
- b)** What do you understand by the term equivalent stiffness of springs? How to find equivalent stiffness of the springs of different combinations? Find the equivalent stiffness of the system shown in Fig. No.1 and find the natural frequency of the system. [8]

**Figure No.1****OR****P.T.O.**

- b) Find the natural frequency of the system shown in Figure No.2. What will be the natural frequency of the system if mass "m" is placed at the end of lever. [8]

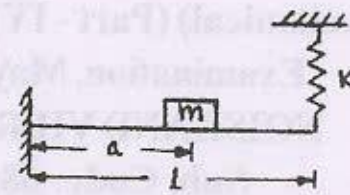


Figure No.2

- a) Derive the equation for logarithmic decrement of single degree, damped, free vibration of simple spring-mass-damper system. Make use of usual notation. [8]
- b) A mass of 20 kg is suspended from a spring of stiffness 3900 N/m . A dashpot is fitted to mass and it is found that the amplitude of vibration diminished from its initial value of 24 mm to 6 mm in two complete cycles. Find the resistance offered by the dashpot at velocity of 0.3 m/s and frequency of damped vibration. Compare this value with frequency of free vibration. [8]
- i) a) Show that the response of steady state vibration of single degree, forced vibration of spring-mass-damper system having harmonic excitation $F_0 \sin \omega t$ or $F_0 \cos \omega t$ is given by equation [8]

$$X = \frac{F_0/K}{\sqrt{\left[1 - \left(\frac{\omega}{\omega_n}\right)^2\right]^2 + \left(\frac{2\zeta\omega}{\omega_n}\right)^2}}$$

- b) A rotating machine of total mass of 200kg is mounted on a set of springs of total stiffness 25000 N/m and a viscous damper with damping coefficient 1000 N-s/m . Machine rotates at a speed of 300 r.p.m. The rotor of the machine is having unbalance in it and produces unbalance force of magnitude 500N. Find amplitude of steady state vibration, force transmitted to the foundation and phase lag. [9]

OR

A mass of 5 Kg suspended by a spring stiffness of 1000 N/m is forced to vibrate by a harmonic force of 10 N. Assuming viscous damping coefficient $c=75 \text{ N-s/m}$, determine amplitude at resonance, the peak amplitude and frequency at peak amplitude [9]

- 4) a) What principal is used in the un-damped dynamic vibration absorber? What are the applications of vibration absorber. [8]

OR

Explain the Rayleigh's method used to determine natural frequencies of multi degree free vibrating system. [8]

- b) Determine the lowest natural frequency of vibrating system shown in figure no. 3 by matrix iteration method. [9]

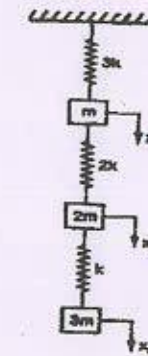


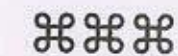
Figure No.3

- a) What is frequency analysis? What is role of frequency analysis in fault diagnosis? [8]
- b) What are the types of exciters? Describe working and use of electromagnetic exciter. [8]
- a) Derive the relationship between sound pressure level, sound intensity level and sound power level. [9]

OR

What are the auditory and non auditory effects of noise on human being? What are the sound pressure limits during day and night time in India? [9]

- b) A Spherical source of sound radiates uniformly in to a large volume of air at NTP condition. The frequency of sound wave is 300 Hz and sound power radiated from source is 40 mW. At a radial distance of 1.5 m from the source determine sound intensity, r.m.s acoustic pressure and particle velocity. [9]



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

Examination, April -2019

REFRIGERATION & AIR CONDITIONING

Sub. Code : 67501

Day and Date : Friday, 26 - 04 - 2019

Total Marks : 100

Time : 2.30 p.m. to 5.30 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)** Explain reversed Carnot cycle with gas as a refrigerant and discuss its limitations. **[10]**

OR

Explain necessity of air craft refrigeration and explain any one air craft refrigeration system.

- b)** A cold storage is to be maintained at -6°C while the surroundings are at 38°C . The heat leakage from the surroundings in to the cold storage is estimated to be 30kW. The actual COP of the refrigeration plant is one third of an ideal plant working between the same temperatures. Find the power required to drive the plant. **[8]**

- Q2) a)** What do you understand by cryogenics? Sketch and explain Linde system. **[8]**

OR

Describe multistage refrigeration with flash gas removal and intercooling.

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- b) A 8 tones Freon- 12 refrigeration plant has saturated suction temperature of -15°C . The condensation takes place at 30°C . Assuming simple saturated vapor compression, find the following using P-h chart [8]

- i) COP of the plant
- ii) Mass flow rate of the refrigerant.
- iii) Power required to run the compressor in kW.

- Q3) a) With neat sketch explain thermostatic expansion valve [8]

OR

How you will suggest compressors for

- i) Domestic refrigerator
- ii) Ice plant
- iii) Package air-conditioners
- iv) Dairy plant

- b) Write notes on [8]

- i) Ice plant
- ii) Cold storage

- Q4) a) i) What is fog air? Explain it with the help of psychrometric chart.
ii) With a neat sketch explain adiabatic saturation temperature. [8]

OR

What is effective temperature? Explain it with the help of comfort chart.

- b) An A/C plant is to be designed for small office room for winter conditions. Outdoor conditions= 10°C DBT & 8°C WBT, Required indoor conditions = 20°C DBT & 60% RH. Amount of free air circulation= $0.3\text{m}^3/\text{min}/\text{person}$. Seating capacity of the office = 50. The required condition is achieved first by heating and then by adiabatic humidifying. Find the following

- i) Heating capacity of the coil in kW and the surface temperature required if the bypass factor of the coil is 0.32.
- ii) Capacity of the humidifier. [8]

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

OR

Explain with neat sketches summer and winter air conditioning systems.

- b) The following data refers to a high humidity chamber. Summer outside condition = 40°C DBT, 27°C WBT, Inside design condition = 25°C DBT, 50%RH, RSH = 58.15kW , RLH= 14.55kW , $70\text{m}^3/\text{min}$ fresh (ventilation) air is supplied to the shop, B.F.=0.15. Find [12]

- i) The ventilation load
- ii) Total load to be taken by the plant
- iii) ESHF
- iv) ADP
- v) Dehumidified air quantity
- vi) Entering and leaving conditions at the apparatus

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

- i) Equal friction method
- ii) Velocity reduction method

OR

Explain friction loss in ducts with the help of friction chart.

- b) Explain with neat sketches single and dual duct systems. [8]

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