III B. Tech II Semester (R09) Regular Examinations, April/May 2012
INDUSTRIAL MANAGEMENT
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   Discuss the contributions of Hawthrone experiments in the development of management thinking.

2   Describe in short "Modern Industrial Organization". Write down the fields of application of this type of organization.

3   How does a cellular layout differ from a process layout?

4   What are the various systems in use of "Predetermined Motion-Time Standards"? Explain one most popular amongst them.

5   Define inventory and classify the same with appropriate examples.

6   The activities involved in SRUTHI Garment Manufacturing Company are listed below with their time estimates. Draw the network for the given activities and carry out the critical path calculations.

Activity	Description predecessor (s)	Immediate	Duration (days)
A	Forecast sales volume	-	10
B	Study competitive market	-	7
C	Design item and facilities	A	5
D	Prepare production plan	C	3
E	Estimate cost of production	D	2
F	Set sales price	B,E	1
G	Prepare budget	F	14

7   What is acceptance sampling? Illustrate the concepts of single and double sampling.

8   How is Human Resource Manager different from other functional managers? Explain.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
INDUSTRIAL MANAGEMENT
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   Differentiate between managerial functions and managerial skills. State and explain each of the above.

2   (a) Explain the difference between authority and responsibility.
       (b) Distinguish between formal and informal organization.

3   ABC company produces a diversified line of metal goods. An analysis of last year's production order shows that seven groups of products account for over 95% of the total business volume. The production routing for these groups are shown below:
       Space requirements for each department are:

Receiving	1500 sq. ft.
A	2500 sq. ft.
B	1500 sq. ft.
C	2000 sq. ft.
D	1000 sq. ft.
E	500 sq. ft.
Shipping	1500 sq. ft.

Group	Percent volume by weight	Department operation sequence			
		1	2	3	4
1	20	A	D	E	
2	25	B	C	D	E
3	10	A	D	E	
4	15	C	B	E	
5	10	A	C		
6	8	A	B	D	E
7	8	C	B		

(a) Prepare a (percent) volume travel chart using the percentage in the table above.
(b) By trial and error on graph paper design a good layout.

4   Explain the basic procedural steps in conducting work study.

5   "Incentives are necessary for smooth and efficient running of an industry". Explain

6   Lay down the steps in setting up control charts.

7   Define "Project"? Explain in detail about the various phases of project management.

8   Explain in detail the logical steps in the purchasing process.
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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
INDUSTRIAL MANAGEMENT
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   (a)   How is 'Marketing' different from 'Selling'?

     (b)   What are the preceding activities involved prior to marketing products?

2   (a)   Define inspection. What are the kinds of inspection?

     (b)   Define the "Quality Control" and explain its advantages over inspection techniques.

3   Explain PERT and its importance in network analysis. What are the requirements for applications of PERT techniques?

4   What is the use of ABC, VED and other classification to departments other than inventory control? What is the use for purchasing, for maintenance and for quality control?

5   Discuss the various factors that need to be considered for a plant location.

6   Describe a committee organization. What are its advantages and weaknesses?

7   'Looking ahead is essence of management' comment.

8   (a)   Explain the two handed process chart with the help of an example.
     (b)   Assume that the total observed time for an operation of assembling an electric switch is 1.00 min. If the rating is 120% find the normal time. If an allowance of 10% is allowed for the operation, determine the standard time.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
INDUSTRIAL MANAGEMENT
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   (a)   What are the duties of purchase manager?

     (b)   Show the organization structure of a medium sized company with purchasing as a
            middle level function.

2   "PERT provides the framework with which a project can be described, scheduled
            and then controlled." Discuss.

3   Differentiate between:
            (a) Cost of quality and value of quality.
            (b) Inspection and quality control.
            (c) Quality of design and quality of conformance.

4   How does job analysis form the basis for job description and job specifications?

5   What are the three levels of management? Briefly explain their functions.

6   What problems do you think might arise in working through a virtual corporation to
            satisfy organizational goals?

7   What are the factors which aid in deciding the location of a plant? Why is location
            planning important?

8   What do you understand by "Work Measurement"? What is its relationship with
            Method study? What are the objectives of work measurement in an industry?

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B.TECH III Year II Semester (R09) Regular Examinations, April/May 2012
CAD/CAM
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   What is product cycle? Explain it with reference to a CAD/CAM application.

2   What are the various co-ordinate systems used in computer graphics. Explain their significance.

3   Explain various curve representation methods used for geometric modeling.

4   What are NC elements? Explain the features of NC machining center.

5   What is FMS? Discuss various components of FMS in detail.

6   What do you understand by MRP- I? Explain.

7   What is a part family? Explain various methods of part family formation.

8   What is quality control? Explain various contact inspection methods.

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B.TECH III Year II Semester (R09) Regular Examinations, April/May 2012
CAD/CAM
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   Explain various display devices used for CAD applications.

2   What is a layer? Explain its concept and use in a drafting package.

3   Discuss various surface representation methods used for geometric modeling.

4   What is a NC machining center? Explain its features. Give some examples.

5   Explain the role of human labour in manufacturing systems.

6   Explain in detail, computer integrated production planning with a block diagram.

7   What is group technology? What are its advantages?

8   What is quality control? Explain various non contact inspection methods.

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B.TECH III Year II Semester (R09) Regular Examinations, April/May 2012
CAD/CAM
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   Explain the basic CAD/CAM hardware applicable to manufacturing environment.

2   Explain various geometric commands used in a drafting package.

3   What are geometric models? Explain various methods of constructing them.

4   What are NC modes? Explain the features of various NC machine tools.

5   Discuss various types of manufacturing systems and their relative applications,
        advantages and disadvantages.

6   What is capacity planning? Explain various strategies in it.

7   What is group technology? Discuss its limitations.

8   Explain various non-contact inspection methods used in computer aided quality control.

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B.TECH III Year II Semester (R09) Regular Examinations, April/May 2012
CAD/CAM
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   Explain various hard copy devices and storage devices used for CAD/CAM applications.

2   With a neat sketch, explain the database structure for graphics modeling.

3   Discuss the modeling facilities desired for geometric modeling.

4   What do NC? Explain the structure and features of CNC machine tool.

5   What do you understand by JIT? Explain with an example.

6   What do you understand by MRP-II? Explain with an example.

7   Explain any one method of coding and classification used in group technology in detail.

8   Explain various optical non-contact inspection methods used in computer aided quality control.

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Code: 9A03603

III B. Tech II Semester (R09) Regular Examinations, April/May 2012
METROLOGY
(Mechanical Engineering)

Time: 3 hours
Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Indian Standard IS: 919 caters for either a hole-based or a shaft-based system of fits. Explain why a 'Hole Based' system is preferred. Also quote one example where it is desirable to use 'shaft based system in a standard limit system.
   (b) What is the equivalent shaft based system fits for the following hole based fits?
        Clearance: H8/g7.
        Transition: H8/r7.
        Interference: H8/u7.
   (c) What type of fit you will recommend for permanent assemblies of machine components? Give a suitable hole-shaft combination for the type of fit you recommended on the hole basis system.

2 What are the applications of slip gauges? Explain how it is possible to build a dimension using a slip gauge set.

3 Define flatness error. Explain the scheme of obtaining flatness error of a surface plate using straight edge and slip gauges.

4 Sketch the schematic of an Eden-Rolt millionth comparator. Explain working. What is the magnification possible?

5 (a) What is mean by drunken thread? How it is caused? What difficulties does it present in finding the pitch of the thread?
   (b) Describe a method to test drunkenness of a 31 mm diameter x 2 mm pitch component machined on centres.

6 (a) Distinguish between 'alignment tests' and 'performance tests on machine tools.
   (b) What is meant by alignment tests on machine tools and why they necessary?

7 (a) What are the sources of errors in manufacturing gears?
   (b) A 40 teeth gear of module 2.5 mm is to be checked by measuring the distance over two pins inserted in the tooth spaces at opposite sides of the wheel. Calculate the diameter of the pin which will rest with its centre at the point and determine the measurement over the pins.

8 (a) Explain the Electroplating process.
   (b) What materials used for plating and explain them with applications?

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
METROLOGY
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   (a)   Explain the various surface treatments process. With neat sketches.
    (b)   What are the advantages of surface engineering?

2   (a)   Name and define the various elements of a spur gear which are checked for the correct functioning of a gear.
    (b)   Calculate chord length and its distance below the tooth tip for a gear of module 3 mm and 20^0 pressure angles.

3   (a)   State Taylor's principle of a gauging of threads.
    (b)   Distinguish between simple and virtual effective diameter of a screw thread.
    (c)   Will a three-wire measuring system also indicate drunken thread. Why or why not/ indicate instruments to indicate a "Drunk" thread?

4   (a)   What is meant by alignment tests on machine tools and why they necessary?
    (b)   Describe the various alignments tests with sketches on lathe machine.

5   (a)   What is interchangeability? What are the requirements for implementing inter changeability? What are its advantages?
    (b)   What is selective assembly? What are its benefits?

6   What is gauge tolerance? What are the difficulties in applying gauge tolerances? Sketch how general gauges are provided gauge tolerances (both plug and ring gauges).

7   (a)   Explain how flatness errors of flat surfaces are measured with an optical flat.
    (b)   Sketch typical fringe patterns which might be observed on slip gauges which are (i) Concave by 0.083µm and (ii) Convex by 0.4 µm over their widths, using cadmium green light of wavelength λ=0.5 µm.

8   What is the principle of twisted strip comparator? Sketch the instrument and explain working of instrument which uses this principle. What is the magnification possible with the instrument?

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
METROLOGY
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   Calculate the limits of size of the components of the fit 25 H8d9. Sketch the fit and label
       all the details. What is the type of fit? 25 mm lies in the diameter step 18 to 30 mm.
       Fundamental tolerance unit $i = 0.45D^{1/3} + 0.001D$ microns. Fundamental deviation for 'd'
       shaft is $-16D^{0.44}$ IT9 =40i and IT 8 = 25 i.

2   (a)   What are the conditions that have to be satisfied in design of gap gauges?
       (b)   Write short notes on combined limit gauges.

3   A measuring machine bed was tested for straightness using an autocollimator and
       reflector and the following reading were obtained.

Position	Angle reading (θ) min	Position	Angle reading (θ) min
a	-----	f-g	20.847
a-b	20.70	g-h	20.838
b-c	21.05	h-i	20.861
c-d	21.11	i-j	20.872
d-e	20.83	j-k	20.871
e-f	20.832		

       If one minute of arc corresponds to 25 μm of the front of the reflector relative to the rear,
       construct a profile graph with respect to initial location of the reflector a-b. What is the
       maximum error?

4   What is the principle of a Taylor Hobson Talysurf? Explain its working with neat
       sketches.

5   (a)   Explain the methods to determine the effective diameter or pitch diameter of threads.
       (b)   Calculate 'best size' wire for the 20 mm ISO coarse 2.5 mm pitch.

6   Describe the various alignments tests with sketches on lathe machine.

7   Write briefly on the optical methods of gears inspection.

8   (a)   What are the advantages of surface engineering?
       (b)   Explain their applications in various fields.

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Code: 9A03603

III B. Tech II Semester (R09) Regular Examinations, April/May 2012
METROLOGY
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   (a)   State various geometrical checks made on machine tools before acceptance.
     (b)   Describe the various acceptance tests on pillar type drilling machine.

2   (a)   Write briefly on the optical methods of gears inspection.
     (b)   Explain what is meant by "Constant Chord" caliper settings. Calculate the chord length and its distance below the tooth tip for a gear of module 2.5 mm and 14.5^0 pressure angles.

3   (a)   State Taylor's principle of a gauging of threads.
     (b)   Show, using diagrams, how this principle may be applied to the design of an internal and external screw thread gauging.

4   (a)   Explain thermo chemical diffusion treatments with neat sketches.
     (b)   Explain laser cladding and Ion implantation process and their applications.

5   (a)   What is tolerance? How is the amount of tolerance decided? Why do people mistakenly go for tighter tolerances?
     (b)   What is interchangeability? What are the benefits derived from interchangeable manufacture?

6   (a)   What are the sources of errors in sine bars? Why is it not advised to use sine bars for measurement of angles beyond 45°?
     (b)   Discuss in brief about sine centres and sine tables.

7   In order to test the straightness of an inverted vee of a guide way in a horizontal plan of a machine tool an autocollimator and a reflector block of 127mm base length tested are used. The reflector block is stamped '30 sec = 0.018 mm'. The readings of the autocollimator at 10 consecutive positions of a 1.5 m long guide way are recorded as:

Position	A	B	C	D	E
Reading	1'30"	1'36"	1'40"	1'48"	1'52"
Position	F	G	H	I	J
Reading	1'54"	1'58"	2'0"	2'4"	2'8"

     (i) Draw a simple sketch of the reflector block indicating the base length and order of flatness of the reflector.
     (ii) Draw the graphical representation of the straightness of the guide way. What is the maximum value of out of straightness?

8   Explain how surface finish affects the performance of machine components with examples.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
REFRIGERATION & AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   (a)   Define a refrigerant. How are refrigerants classified?
    (b)   Differentiate between primary and secondary refrigerants.

2   Explain with the graphs the effects of evaporator temperature and supply steam pressure
          on the consumption of steam required per ton of refrigeration and give the causes.

3   (a)   With (or) without evaporative cooling explain boot strap air refrigeration system.
    (b)   Ice is formed at 0^oC from water at 20^oC. The temperature of the brine is -8^oC. Find out
          the Kg of Ice formed per Kwh. Assume that the refrigeration cycle used is perfect reversed
          Carnot cycle. Take latent heat of Ice as 335 KJ/Kg.

4   (a)   State the merits and demerits of "Vapour Compression System" over air refrigeration
          system.
    (b)   A vapour compression refrigerator uses Methyl Chloride (R-40) and operates between
          temperature limits of -10^oC and 45^oC. At entry to the compressor the refrigerant is dry
          saturated after compression it acquires a temperature of 60^oC. Find the C.O.P. of the
          refrigerator. The relevant properties of Methyl Chloride are as follows:

| Saturation | Enthalpy in kJ/Kg | | Entropy in kJ/Kg | |
temperature in 0^oC	Liquid	Vapor	Liquid	Vapour
-10	45.4	460.7	0.183	1.637
45	133.0	483.6	0.485	1.587

5   (a)   Prove the C.O.P of vapour absorption system is equal to $\dfrac{T_3 - T_2}{T_3} \times \dfrac{T_1}{T_2 - T_1}$.

    (b)   Explain the vapour absorption system which works on Dalton's law of pressure?

6   A room 7 m X 4 m X 4 m is occupied by an air-water vapour mixture at 38^0C. The
          atmospheric pressure is 1 bar and the relative humidity is 70%. Determine the humidity
          ratio, dew point, mass of dry air and mass of water vapour. If the mixture of air-water
          vapour is further cooled at constant pressure until the temperature is 10^0C. Find the
          amount of water vapour condensed.

7   a   What is the function of a fan in an air-conditioning system?
    b   Explain the various types of axial flow fans.

8   a   Define the "Human Comfort" and explain the factors which affect human comfort.
    b   Define the team "Effective Temperature" and explain the significance in the design of air
          conditioning systems.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
REFRIGERATION & AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) List out the merits and demerits of thermo-electric refrigeration system over other refrigeration system.
   (b) What are the fields of applications of thermo-electric refrigeration?

2 (a) Define dry bulb temperature with effect from bulb temperature, dew point and relative humidity.
   (b) Show following processes on psychometric chart:
        1. Sensible heating.
        2. Cooling with dehumidification.

3   A classroom of 60 seating capacity is air-conditioned. The outdoor conditions are 32^0C DBT and 22^0C WBT. The required comfort conditions are 2.2^0C DBT and 55% RH. The quantity of outdoor air supplied is 0.5 m^3/min/ student. The comfort conditions are achieved first by chemically dehumidifying air and then cooling it. Find the following:
        (i) DBT of air leaving the dehumidifier (ii) capacity of the dehumidifier (iii) capacity of the cooling coil in tons of refrigeration (iv) If the by-pass factor of the cooling coil is 0.3, then find the surface temperature of the cooling coil.

4   Discuss the conditions of comfort that you would prescribe for an office in a city like Chennai where hot and humid climate prevails.

5 (a) Write the factors considering in selecting the refrigeration system for aeroplane.
   (b) How closed air refrigeration system is advantages over open air refrigeration system?

6   Explain the points of difference between the practical vapour compression cycle and the theoretical cycle working between the same pressure limits. What is the effect on the performance of the cycle? Illustrate your answer with assumed data.

7 (a) Why ammonia is not used in domestic refrigerator?
   (b) How will you locate leaks in NH_3 and Freon system?
   (c) Why CFC and HCFC refrigerants are to be replaced? Explain.

8 (a) How is refrigeration achieved in an absorption system?
   (b) Explain the following accessories:
        (i) Analyzer.   (ii) Heat Exchanger.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
REFRIGERATION & AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   (a) What is the difference between design and supply conditions?
     (b) Write the Carrier's equation for partial pressure of vapour and explain all terms.

2   (a) Define the figure of merit related to thermo-electric refrigeration system and explain its effect on COP of the system.
     (b) List out the merits and demerits of thermo-electric refrigeration system and explain its effect on COP of the system.

3   The following data refer to an air conditioning system for industrial process for hot and wet summer conditions:
          Outdoor conditions   = 30^0C DBT and 75% RH.
          Required conditions   = 22^0C DBT and 70% RH.
          Amount of out-door air supplied = 200 m^3/min.
          Coil dew point temperature = 14^0C.
          If the required condition is achieved by first cooling and dehumidifying and then by heating, find: (i) The capacity of the cooling coil and its by-pass factor.
          (ii) The capacity of the heating coil and surface temperature of the heating coil if the by-pass factor is 0.2.

4   The air-handling unit of an air-conditioning plant supplies a total of 4500 m^3/min of dry air which comprises by weight 20 percent fresh air at 40^0C DBT and 27^0C WBT and 80 percent recirculated air at 25^0C DBT and 50% RH. The air leaves the cooling coil at 130 c saturated state. Calculate the total cooling and room heat gain.

5   (a) What is the main characteristic feature of an air refrigeration system?
     (b) What are the advantages of closed air refrigeration system over open air refrigeration system?

6   (a) When desalting of water is necessary? Which refrigerant is used for water desalting and why?
     (b) What is the importance of die-electric strength and volume resistivity in selecting proper refrigerant?

7   (a)   What is the function of a throttle valve in vapour compression refrigeration system?
    (b)   A vapour compression refrigerator works between the pressure limits of 60 bar and 25
           bar. The working fluid is just dry at the end of compression and there is no under cooling
           of the liquid before the expansion valve. Determine (i) C.O.P. of the cycle
           (ii) Capacity of the refrigerator. If the fluid flow at the rate of 5 Kg/min. Given following
           data.

Pressure (bar)	Saturation Temp (K)	Enthalpy (KJ/kg)		Entropy (KJ/Kg)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.96	239.38	0.554	1.0332
25	261	56.32	322.58	0.226	1.2464

8   (a)   Prove the equation of maximum C.O.P of a vapour absorption system with common
           notations.
    (b)   What are the desirable and undesirable features of lithium bromide – water and H_2O –
          NH_3 for absorption system?

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
REFRIGERATION & AIR CONDITIONING
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) What do you understand by closed and open system of air refrigeration?
   (b) A Carnot heat engine drives heat from a reservoir at a temperature T_1 and rejects heat to another reservoir at a temperature T_3. The Carnot forward cycle engine drives a Carnot reversed cycle engine or Carnot refrigerator which absorbs heat from reservoir at temperature T_2 and rejects heat to a temperature T_3. If the high temperature $T_1 = 600$ k and low temperature $T_2 = 300$ K. Determine C.O.P

2 (a) How is evaporator and condenser temperature defined? Is it the temperature at which refrigerant enters these components?
   (b) A refrigerator using NH_3 works between the temperatures $-10^{o}C$ and $25^{o}c$. The gas is dry at the end of compression and there is no under cooling of liquid. Calculated the theoretical C.O.P. of the cycle.

3 (a) Can water be a good refrigerant for domestic unit. Explain.
   (b) How designation system is used for refrigerants? Designate any two refrigerants.

4 (a) Find the maximum C.O.P of a vapour absorption refrigeration system in which heating, cooling and refrigeration takes place at the temperatures of $100^{o}C$, $20^{o}C$ and $-5^{o}C$ respectively.
   (b) The total pressure maintained in an Electrolux refrigerator is 14.71 bars. The temperature obtained in the evaporator is $-15^{o}C$. The quantities of heat supplied in the generator are:
        (i) 418.7 kJ to dissociate 1 Kg of vapour. (ii) 1465.4 KJ/Kg for increasing the total enthalpy of NH_3.The enthalpy of NH_3 entering the evaporator is 335 KJ/kg. Take the following properties of NH_3 at $-15^{o}C$. Pressure = 2.45 bar, enthalpy of NH_3 vapour = 1666 KJ/kg, specific volume = 0.5 mt^3/Kg. The hydrogen enters the evaporator at $25^{o}C$, Gas constant of H_2 = 4.218 KJ/kg^{o}C. Specific heat of H_2 = 12.77 KJ/kg^{o}C. Find the C.O.P of the system assuming NH_3 leaves evaporator in saturated condition.

5 (a) How can you use a thermoelectric refrigerator as a heat pump?
   (b) Give the general expression for COP of the vortex tube.

6 (a) Define relative humidity and specific humidity.
   (b) Differentiate between ventilation load and Infiltration load.

7 (a) What are the purposes of automatic controls in an air conditioning system?
   (b) Explain the function of basic components of automatic control circuit of an air conditioning system.

8 (a) List the variables which are involved in the estimation of load.
   (b) Enumerate and explain the components of cooling-load estimate.
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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
DESIGN OF MACHINE ELEMENTS - II
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70
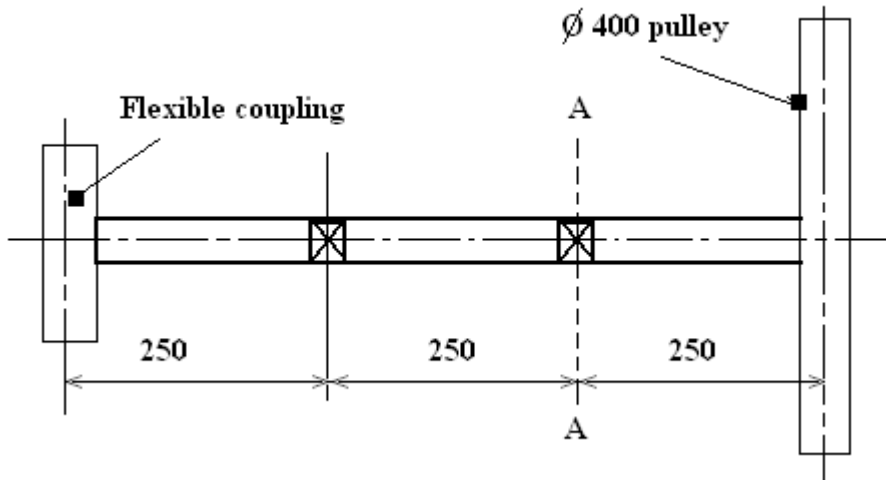
Design data book is permitted in the examination

Answer any FIVE questions
All questions carry equal marks
*****

1   (a)   Explain the characteristics of sliding and rolling contact bearing.
    (b)   A bearing is required to carry 4500 N stationary radial load. The shaft rotates at 1000 rpm and the life desired is 30000 hrs. The running conditions are steady, no shock loading select a suitable bearing.

2   (a)   Discuss the design and construction of a cylinder.
    (b)   Explain different types of cylinder liners with neat sketches.

3   Design completely a connecting rod, the bolts for the big end cap for a medium speed, four cylinders I.C. engine, given the following data:
          Piston diameter = 100 mm.
          Stroke = 125 mm.
          Weight of reciprocating parts = 1.3 kg.
          Length of the connecting rod = 310 cm.
          RPM of the engine-normal = 1200.
          RPM of the engine-over speed = 2000.
          Maximum explosion pressure = 2.8 MPa.
          State clearly the values adopted for the factors of safety and the ultimate stresses and underline them. Draw freehand sketch to about full size, a proportionate elevation of the connecting rod and add either an end view or a sectional plan.

4   Draw the distribution of bending stresses in curved beams.

5   A vertical two start square threaded screw of 100 mm mean diameter and 20mm pitch supports a vertical load of 18 kN. The nut of the screw is fitted in the hub of a gear wheel having 80 teeth which meshes with a pinion of 20 teeth. The mechanical efficiency of the pinion and gear wheel drive is 90 percent. The axial thrust on the screw is taken by a collar bearing 250 mm outside diameter and 100 mm inside diameter. Assuming uniform pressure conditions, find, minimum diameter of pinion shaft and height of nut, when coefficient of friction for the vertical screw and nut is 0.15 and that for the collar bearing is 0.20. The permissible shear stress in the shaft material is 56 MPa and allowable bearing pressure is 1.4 N/mm2.

6   A shaft transmits maximum power from a pulley to a flexible coupling. The shaft rotates at 900 rev/min, the pulley is 400 mm in diameter, and the belt is 50 mm wide and 6mm thick. Maximum stress in the belt is 2 Mpa, and the coefficient of friction is 0.3. If the shaft is to be checked for strength at section A-A. What bending moment and what torque should be used? Leather has a density $\rho = 970$ kg/m^3.

7   (a)   A helical torsion spring of mean diameter 60 mm is made of a round wire of 6 mm diameter. If a torque of 6 N-m is applied on the spring, find the bending stress induced and the angular deflection of the spring in degrees. The spring index is 10 and modulus of elasticity for the spring material is 200 kN/mm2. The number of effective turns may be taken as 5.5.

     (b)   A load of 1 kN is dropped axially on a close helical compression spring; from a height of 250 mm. the spring has 20 active coils. Take wire diameter as 20 mm. Spring index is 8. Determine the deflection and stress induced in the spring. Take G = 0.84x10^5 MPa.

8   A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
DESIGN OF MACHINE ELEMENTS - II
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Design data book is permitted in the examination

Answer any FIVE questions
All questions carry equal marks
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1   A reciprocating compressor is to be connected to an electric motor with the help of spur gears. The distance between the shafts is to be 500 mm. The speed of the electric motor is 900 r.p.m. and the speed of the compressor shaft is desired to be 200 r.p.m. The torque, to be transmitted is 5000 N-m. Taking starting torque as 25% more than the normal torque, determine:
     (1) Module and face width of the gears using 20 degrees stub teeth, and
     (2) Number of teeth and pitch circle diameter of each gear. Assume suitable values of velocity factor and Lewis factor.

2   A composite spring has two closed coil helical springs. The outer spring is 15 mm larger than the inner spring. The outer spring has 10 coils of mean diameter 40 mm and wire diameter 5 mm. The inner spring has 8 coils of mean diameter 30 mm and wire diameter 4 mm. When the spring is subjected to an axial load of 400 N, find:
     (1) compression of each spring,
     (2) load shared by each spring, and
     (3) shear stress induced in each spring. The modulus of rigidity may be taken as 84 kN/mm2.

3   A bar is raised and lowered by two 38 mm square threads having a pitch of 7 mm. Determine the force required at a radius of 80 mm to raise or lower at 11000 N cross bar of a planer. The screw and nut materials are steel bronze respectively. The collar materials are steel and bronze respectively. The collar material is steel; it has an outside diameter of 76 mm and an inside diameter of 38 mm; coefficients of friction at threads and at collar are 0.11 and 0.13 respectively.

4   (a)   Discuss the different types of belts and their material used for power transmission.
     (b)   Sketch the cross-section of a *V*-belt and label its important parts.

5   A rolling contact ball bearing is to be selected to support an overhung countershaft. The shaft speed is 700 r.p.m. The bearing is to have 99% reliability corresponding to a life of 25000 hours. The bearing is subjected to an equivalent radial load of 1 kN. Consider life adjustment factors for operating condition and material as 0.9 and 0.85 respectively. Find the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 90% reliability.

6   (a)   What is the effect of number of cylinders on the performance of an I.C. engine?
     (b)   Write about piston rings, with neat sketch.

7   Diameter of piston = 0.1525 m; weight of reciprocating parts = 27.5 N; length of connecting rod (centre to centre) = 0.495 m; stroke = 0.215 m; rpm = 2000 (when developing 50 kW); possible over speed = 3000 rpm; compression ratio = 6:1; maximum explosion pressure = 3.5 MPa. Design a connecting rod for a high speed, four stroke I.C engine. The following data are available. Assume suitable missing data.

8   The section is a rectangular 6 cm X 4 cm. The centre of curvature of the section is at distance of 8 cm from the centroid of the section. A load of 15 kN is acting through the centre of curvature. Determine the maximum and minimum stresses in the hook.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
DESIGN OF MACHINE ELEMENTS - II
(Mechanical Engineering)

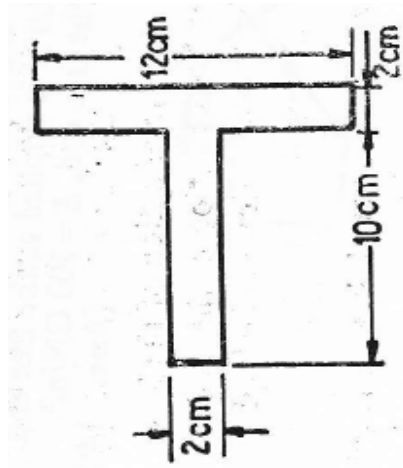Time: 3 hours   Max Marks: 70

Design data book is permitted in the examination

Answer any FIVE questions
All questions carry equal marks
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1   (a)   What are different types of bearing?
     (b)   Explain hydrodynamic bearing with neat sketch.

2   Explain the function of the following for I.C engine piston:
            (a) Ribs   (b) Piston rings   (c) Piston skirt

3   (a)   Explain buckling phenomena of connecting rod for I-cross section. With diagram.
     (b)   Write about "Shims" and "Crush" in connecting rod.

4   A circular ring is subjected to a pull of 15 kN. The ring is of **T-section** as shown in figure and the initial radius is 10 cm. Determine the maximum and minimum stresses in the ring.

5   A flat open belt horizontal drive is to transmit 10 kW at 720 r.p.m. The motor shaft carries the driving pulley of 300 mm diameter while driven pulley is 300 mm diameter while driven pulley is 1000 mm in diameter. Take belt thickness = 9.5 mm, density of belt material = 1000 kg/m^3, maximum permissible stress = 2.5 MPa, Center distance = 3 m and coefficient of friction = 0.3. Find the width of the belt.

6   A vertical screw with single start square threads of 50 mm mean diameter and 12.5 mm pitch is raised against a load of 10 kN by means of a hand wheel, the boss of which is threaded to act as a nut. The axial load is taken up by a thrust collar which supports the wheel bossand has a mean diameter of 60 mm. The coefficient of friction is 0.15 for the screw and 0.18 for the collar. If the tangential force applied by each hand to the wheel is 100 N, find suitable diameter of the hand wheel.

7   (a)   Explain the following terms of the spring :
            (*i*) Free length;   (ii) solid height;   (iii) spring rate;   (iv) active and inactive coils;
            (v) spring index; and   (vi) stress factor.
    (b)   Design a helical compression spring for a maximum load of 1000 N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 kN/mm2.

$$\text{Take Wahl's factor, } K = \frac{4C-1}{4C-4} + \frac{0.615}{C}, \text{ , where C = Spring index}$$

8   A pair of helical gears with 30° helix angle is used to transmit 15 kW at 10 000 r.p.m. of the pinion. The velocity ratio is 4:1. Both the gears are to be made of hardened steel of static strength 100 N/mm2. The gears are 20° stub and the pinion is to have 24 teeth. The face width may be taken as 14 times the module. Find the module and face width from the standpoint of strength and check the gears for wear.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
DESIGN OF MACHINE ELEMENTS - II
(Mechanical Engineering)

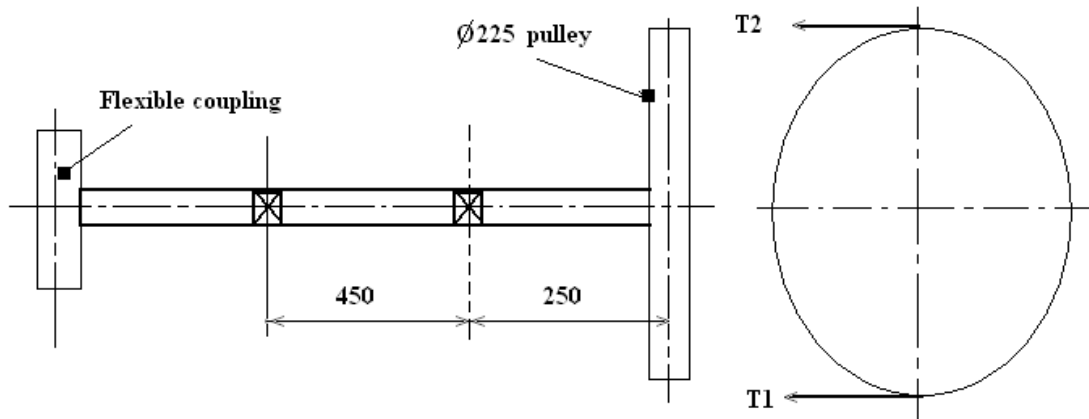Time: 3 hours   Max Marks: 70

Design data book is permitted in the examination

Answer any FIVE questions
All questions carry equal marks
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1   A motor shaft rotating at 1500 r.p.m. has to transmit 15 kW to a low speed shaft with a
         speed reduction of 3:1. The teeth are 14 ½ ^{0} involutes with 25 teeth on the pinion. Both
         the pinion and gear are made of steel with a maximum safe stress of 200 MPa. A safe
         stress of 40 MPa may be taken for the shaft on which the gear is mounted and for the
         key. Design a spur gear drive to suit the above conditions. Also sketch the spur gear
         drive. Assume starting torque to be 25% higher than the running torque.

2   (a) Explain what you understand by A.M. Wahl's factor and state its importance in the design
          of helical springs.
     (b)   A mechanism used in printing machinery consists of a tension spring assembled with a
           preload of 30 N. The wire diameter of spring is 2mm with a spring index of 6. The spring
           has 18 active coils. The spring wire is hard drawn and oil tempered having following
           material properties: Design shear stress = 680 MPa modulus of rigidity = 80 kN/mm^2
           Determine: (1) The initial torsional shear stress in the wire; (2) spring rate; and (3) the
           force to cause the body of the spring to its yield strength.

3   A machine vice has single start, square threads with 22 mm nominal diameter and 5mm
         pitch. The outer and inner diameters of friction collar are 55 and 45 mm respectively. The
         vice can be operated with a force of 125 N on the handle having a mean radius of 150
         mm. the friction coefficients for thread and collar are .0.15 and 0.17 respectively.
         Assuming uniform wear for the collar calculate: (i) the clamping force at the jaws (ii) the
         overall efficiency of the clamp.

4   (a) Name a few applications of rolling contact bearings.
     (b) A 6207 radial bearing is to operate in the following work cycle:
            Radial load of 4500 N at 150 rpm for 30% of time.
            Radial load of 6750 N at 600 rpm for 10% of time.
            Radial load of 2250 N at 300 rpm for 60% of time.
          The inner-ring rotates; loads are steady, what is the expected average life of the bearing.

5   (a) Enumerate the qualities of good cylinder liners.
     (b) What is the function of piston? Explain piston troubles.

6   A 225 pulley is keyed to a shaft and the center plane of the pulley overhangs the nearer bearing by 250 mm, as shown below figure. An open belt arrangement is used. The pulley is driven by an 1800 rev/min motor through a flat belt with a 1 to1 velocity ratio of the pulleys. The belt is 9.5 by 150 mm and weighs 970 kg/m^3. The coefficient of friction between the belt and pulleys is 0.3. The belt runs at its maximum capacity with maximum belt stress of 2 MPa. It is decided that the power capacity is to be doubled and if the several possibilities, this problem will concern itself with the effect of increasing the belt width. Assume that the belt width is to be increased. With all other conditions remaining the same. How much should be belt width be increased to double the power capacity?

7   Design a hook and its support for a 20 KN crane. The hook is of swiveling type and of trapezoidal section having a bed diameter of 80 mm. The side members and the bridge are of forged steel. Design the hook for 50% overload. Assume suitable allowable stresses and draw a detailed drawing of the hook.

8   (a)   What are the main requirements of an internal combustion engine crank shaft?
      (b)   What is the function of connecting rod of an I.C. engines?

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
AUTOMOBILE ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   What are the essential requirements to be satisfied by material for the following automobile engine components? Piston, piston rings, cylinder block, inlet valve and exhaust valve, crank shaft.

2   (a) What is the need for individual pump system? What are its advantages?
    (b) What are the most common types of nozzles used? Explain.

3   (a) What are the advantages of battery ignition system over magneto coil ignition?
    (b) Explain with a neat sketch the working principle of evaporative cooling system used in automobile.

4   (a) What are the main sources of pollutants from gasoline/petrol engines?
    (b) What are the sources of HC formation in petrol engine? Explain various factors which effect the HC formation.

5   Explain in detail the procedure adopted to test the working of a generator regulator system.

6   Explain clearly the term 'Turning Radius' as applied to wheels.

7   With a neat sketch, Explain the construction and working of the rigid front axle.

8   Describe with a neat sketch the working of a single plate clutch.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
AUTOMOBILE ENGINEERING
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   (a)   What is the difference between real wheel drive and front wheel drive? Explain.
     (b)   Explain the load on the chassis frame and axles.

2   (a)   Explain with neat diagram the working principle of zenith carburettor.
     (b)   How the starting difficulty with simple carburettor can be overcome? Explain.

3   Make out the circuit diagram for the ignition system of a six cylinder automobile petrol engine and explain the function of each component.

4   Explain in detail any two of the following methods of SI engine emission control:
            (i) Modification in the engine design and operating parameters.
            (ii) Treatment of exhaust products of combustion.
            (iii) Modification of fuels.

5   What are the different methods available to control generator output? Discuss the construction and working of a combined voltage and current regulator.

6   (a)   What are the functions of the steering system?
     (b)   What are the components of the steering system?

7   (a)   Name the various kinds of springs used in suspension system of automobiles.
     (b)   Sketch a typical front suspension system. Explain.

8   Discuss the various types of gear boxes used in automotive vehicles.

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
AUTOMOBILE ENGINEERING
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   Which are the different types of oil pumps in the engine lubrication? Describe the help of sketch a construction and working of any one type of oil pump.

2   (a) What are the advantages of fuel injection in S.I. engines?
    (b) Explain the working of diesel injection pump.

3   Why is cooling necessary for I.C. engines? What kind of cooling system is employed for mobile units like automobiles? What are the effects of load and speed on the heat loss through cylinder walls?

4   (a) What is the different emission control systems used in SI engines?
    (b) What is exhaust gas recirculation? What is its effect on emissions?

5   Discuss about the various types starting system trouble shooting.

6   How the gear ratio of a steering gear is are computed? What two functions do steering gears perform?

7   What are the various types of power brakes? Discuss their merits and demerits.

8   Why is the clutch placed between the engine flywheel and the transmission, what factors it depends?

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III B. Tech II Semester (R09) Regular Examinations, April/May 2012
AUTOMOBILE ENGINEERING
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1   (a)   State the advantages of the frame less construction of an automobile? What are its disadvantages?
    (b)   State the functions of automobile power transmission system.

2   (a)   Explain with neat sketch the working principle of accelerating fuel pump during high speed conditions.
    (b)   What is the function of idling system? Why it is necessary? Explain.

3   (a)   Explain briefly how the high voltage required for sparking is built up by the battery ignition system.
    (b)   Sketch the "Positive Earth" coil ignition system of modern automobile vehicles.

4   Explain briefly the following:
          (i)Three – way catalytic converter.
          (ii)Two – way catalytic converter.
          (iii)Noble metal catalytic converter.

5   Explain briefly over running clutch drive mechanism used in cranking and starting an engine.

6   Explain how kingpin inclination or steering axis inclination produces directional stability.

7   How would you carry out road testing of engine and the vehicle?

8   (a)   What are the functions to be performed by a transmission system in automobiles?
    (b)   What are the different types of transmission used in automobiles?

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