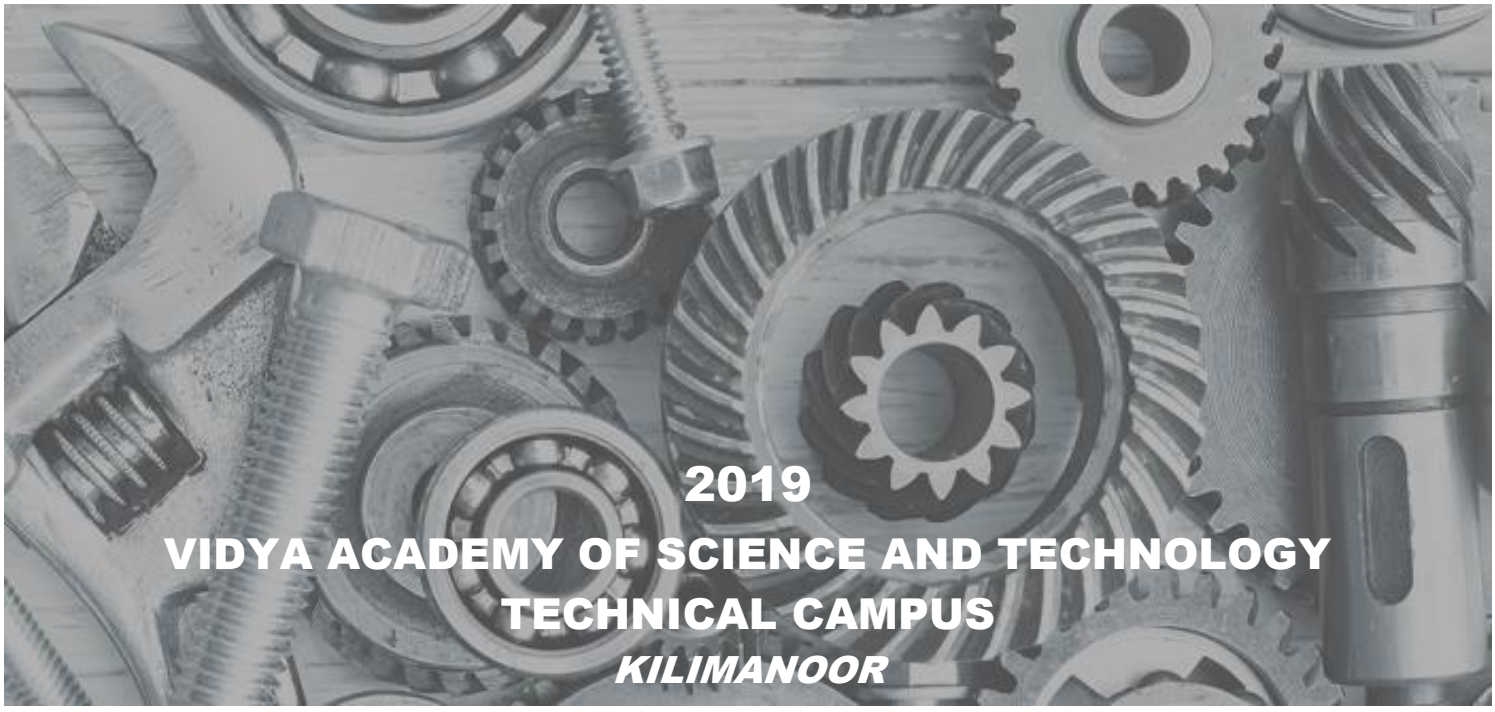
S7 QUESTION BANK

DEPARTMENT OF MECHNAICAL ENGINEERING



2019

VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY TECHNICAL CAMPUS

KILIMANOOR

SUB CODE ME465 SUBJECT NAME INDUSTRIAL HYDRAULICS

MODULE 1

1. Explain Hydraulics and Pneumatics systems
2. Explain different properties of fluids
3. Explain different criteria for selection of fluids
4. Explain additives used in fluids
5. Explain the effect of temperature and pressure on fluids
6. What are the physical parameters of fluids
7. Explain Hydraulic symbols

MODULE 2

1. Explain the classification pumps
2. Explain the principle of working & constructional details of vane pump
3. Explain the principle of working & constructional details of gear pump
4. Explain principle of working & constructional details of radial pump
5. Explain principle of working & constructional details of axial pump
6. Explain the operating characteristics curve for pumps
7. Explain the selection criteria for the selection of pumps

MODULE 3

1. Explain the concept of Hydraulic cylinders
2. Explain the concept of Hydraulic rams
3. Explain the functions of Pressure accumulators
4. Explain the functions of Fluid reservoirs
5. Explain the functions Filter in hydraulic circuits
6. Explain the materials of Filter in hydraulic circuits

SUB CODE ME465 SUBJECT NAME INDUSTRIAL HYDRAULICS

MODULE 4

1 Explain the classification of actuators

2 Explain principle of working & constructional details of vane motors

3 Explain principle of working & constructional details of gear motors

4 Explain principle of working & constructional details of piston motors

5 Explain principle of working acceleration of actuators

6 Explain principle of working deceleration of actuators

7 Explain the classification of cylinders

8 Explain the classification of mountings

9 Explain the design criteria of cylinders

10 Explain cushioning of cylinder

MODULE 5

1 Explain the how temperature and pressure is controlled in hydraulics system

2 Explain the classification of control valves

3 Explain the classification of sequence valves

4 Explain the classification of counter balance valves

5 Explain the classification of unloading valves

6 Explain the classification of friction control valves

7 Explain the classification of hoses and pipes

8 Explain the different materials of hoses and pipes

9 Explain how pressure drops of hoses and pipes can be rectified

MODULE 6

1 Explain Regenerative circuit

2 Explain Speed control (Meter in, Meter out and bleed off) circuit

3 Explain Sequencing and Synchronization circuit

4 Explain transverse and feed circuit

5 Explain circuit for riveting machine

SUB CODE ME465 SUBJECT NAME INDUSTRIAL HYDRAULICS

6 Explain circuit for automatic reciprocating, fail safe .

7 Explain counter balance circuit

8 Explain actuator locking, circuit for hydraulic press,

9 Explain unloading circuit

10 Explain unloading circuit

MODULE 1

1. Explain the working of LVDT
2. Explain the different types of position and displacement sensors which used magnetic, optical, ultrasonic, inductive, capacitive and eddy current methods
3. Explain the major components of a mechatronic system
4. Explain the methods of high temperature measurement
5. Explain the working of incremental and absolute optical encoders. Why grey code is used in coding absolute encoders
6. What is a Corioli's flow meter?
7. Explain the term sensitivity of a measuring instrument
8. Define the terms stability and resolution
9. Differentiate between RTD and thermocouple
10. Explain the term sensitivity of a measuring instrument
11. Explain the various types of vibration sensors and its working principle.
12. With block diagram explain acoustic emission sensor working principle
13. Explain principle of flow sensors.
14. Explain the principle of pressure sensors
15. Describe about resolvers and synchros

MODULE 2

1. Explain the advantages of pneumatic actuators over hydraulic ones
2. Explain cushioning of pneumatic cylinders
3. What do you mean by cushioning of fluid power actuators?
4. Explain the components of a hydraulic actuation system with neat sketches and block diagrams. Distinguish between a servo valve and a direction control valve
5. Describe various types of pressure control valves
6. Discuss the use of different types of valves and their actuation mechanisms.
7. Explain about rotary actuators.
8. Give an account of development of simple hydraulic circuits using standard symbols.
9. Give an account of development of simple pneumatic circuits using standard symbols.

SUB CODE ME407 SUBJECT NAME MECHATRONICS

MODULE 3

1 Explain the working of a parallel plate MEMS accelerometer.

2 Why CVD is preferred over PVD in MEMS fabrication?

3 What is meant by deep reactive ion etching and what are its advantages?

4 What is plasma sputtering?

5 What is plasma sputtering?

6 Explain any two silicon based MEMS fabrication methods.

7 With the help of neat sketch explain the working of any one MEMS based accelerometer

8 Describe about different methods of MEMS fabrication

9 Explain the working of a MEMS gyroscope.

10 Explain how a MEMS parallel plate accelerometer works.

MODULE 4

1 Explain the stick and slip effect in friction guide ways.

2 Explain latching in PLC ladder logic

3 Explain hydrostatic bearings in CNC machines

4 Explain the preloading of ball screws in recirculating ball screw mechanisms.

5 What do you understand by antifriction bearings.

6 Explain with the help of neat sketch : 1) Linear bearing 2) Recirculating ball screws 3) Hydrodynamic bearings.

7 Explain a closed loop control system

8 Explain the different types of NC controls.

9 Design an automatic car park barrier system using PLC and pneumatic actuators

10 Explain the different types of guide ways and its advantages and disadvantages.

MODULE 5

1 What is brushless motor?

2 Determine the mathematical model of a mercury in glass thermometer dipped in to hot water and hence determine its system parameters.

3 Explain the mathematical model for a thermal system under conductive heat transfer

4 Explain various types of range finders.

5 Explain any two range finding methods using laser beams

6 Distinguish between servo and stepper motors

7 Distinguish between tactile and proximity sensors.

8 Explain the working of a tactile sensor.

9 What is harmonic drive?

10 Explain the mathematical model for a spring-mass-dashpot system.

11 Explain the construction and working of any two types of tactile sensors used in robotics.

MODULE 6

1 What is meant by thresholding in image processing?

2 Design an automatic car park barrier system using PLC and pneumatic actuators.

3 With the help of a block diagram explain how a robot see an object.

4 Explain the application of mechatronics in a modern engine management system, with regards to the sensors, control system and actuators

5 Explain various image processing techniques

6 Explain the working and design of an automatic camera.

7 Briefly explain the principle of a bar code reader.

8 Explain the difference between CCD and CID cameras.

9 Explain the terms sliding, stretching, equalizing and thresholding in histogram processing

10 Briefly explain the study of a pick and place robot.

11 Briefly explain the study of an automobile engine management system.

SUB CODE ME 401 SUBJECT NAME DESIGN OF MACHINE ELEMENTS – I

MODULE 1

1 Explain various steps in design process with the help of diagram. 10

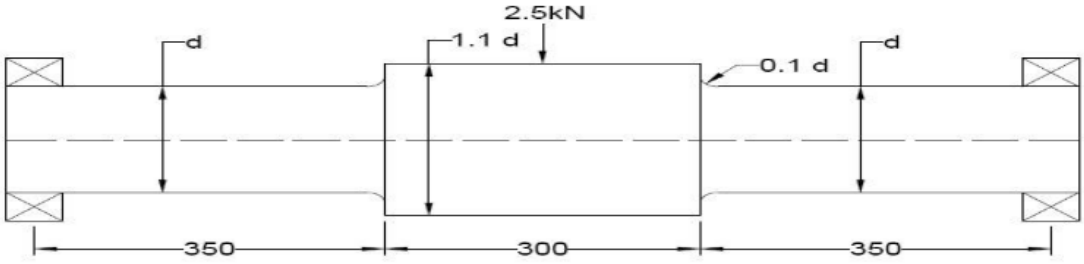
2 State the difference between elastic and plastic materials with help of stress – strain relationship diagrams. 10

3 a) Define notch sensitivity index. 20
b) Explain Wahl stress concentration factor.
c) Derive an expression for equivalent torque of a shaft
d) Explain the properties to be considered while selecting material for engineering design.
e) Explain the uses of stress concentration factor and notch sensitivity factor in conservative design procedure.

4 Draw stress - strain relationship diagrams for: 10

a. Perfectly rigid materials
b. Perfectly plastic materials
c. Elastic perfectly plastic materials
d. Brittle materials
e. Ductile materials

5 A non rotating shaft supporting a load of 2.5 kN as shown in figure. The shaft is made of brittle material, with an ultimate tensile strength of 300 N/mm2. The factor of safety is 3. Determine the dimensions of the shaft.



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6 Explain theories of failure which are commonly used for brittle materials. 4

7 Derive and expression for equivalent bending moment for a shaft subjected to combined twisting and bending moment. 10

8 A stepped shaft with a reduction ratio of 1.2 is to have a fillet radius of 10% of the smaller diameter. The material of the shaft has a notch sensitivity factor of 0.925, a shear stress of 160 N/mm^2 at yield and a shear stress of 120 N/mm^2 at endurance limit. Determine the diameter of shaft at the minimum cross section to sustain a twisting moment that fluctuates between 500 Nm (clockwise) and 800 Nm (anticlockwise)

20

9 Explain Goodman method for combination of stresses. 4

10 Explain Torsional rigidity and Lateral rigidity. 4

11 A steel shaft 35 mm in diameter and 1.2 m long held rigidly at one end has a hand wheel 500 mm in diameter keyed to the other end. The modulus of rigidity of steel is 80 GPa.

a) What load applied to tangent to the rim of the wheel produce a torsional shear of 60 MPa?
b) How many degrees will the wheel turn when this load is applied? 10

SUB CODE ME 401 SUBJECT NAME DESIGN OF MACHINE ELEMENTS – I

MODULE 2

1 What are the factors that affect endurance limit of a machine part? 4

2 State maximum shear stress and maximum strain energy theory of failure 4

3 Derive Soderberg's equation for variable stresses and state its application to different types of loading. 4

4 What is meant by factor of safety? What are the factors to be considered while selecting a factor of safety for a particular application? 4

5 List out the factors affecting endurance limit? 4

6 The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to

a) Maximum principal stress theory
b) Maximum shear stress theory
c) Maximum principal strain theory
d) Maximum strain energy theory
e) Maximum distortion energy theory 10

7 A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10 kN-m and a torsional moment of 30 kN-m. Determine the diameter of the shaft using two different theories of failure, and assuming a factor of safety of 2. Take E = 210 GPa and poisson's ratio = .25 10

8 A bolt is subjected to direct tensile load of 20 kN and shear load of 15 kN. The yield stress in simple tension is 360 MPa. The factor of safety of 3 should be used. Find the suitable diameter of the bolt according to distortion energy theory?

9 A shaft is designed based on maximum energy distortion as the criterion of failure and factor of safety of 2. The material is 30C* steel with S_{yt} = 310 MPa. The shaft is subjected to an axial load of 40 kN. Diameter of shaft is 20 mm. Find the maximum torque that can be applied to shaft before yielding. 10

10 A component is subjected to completely reversed stress cycle which vary over an half minute time period as follows:
500 MPa for 10 cycles, 600 MPa for 5 cycles, 700 MPa for 3 cycles. The corresponding fatigue life for the above stresses are $1x10^5$ cycles, 0.4×10^5 cycles and 0.15×10^5 cycles rapidly. Find the fatigue life of the component in hours. 10

MODULE 3

1 What are the advantages of preloading of bolts in a bolted joint? 4

2 A bolt is subjected to a direct tensile load of 25 kN and shear load of 15 kN. Find the suitable size of the bolt, using various theories of failure. Yield stress in tension = 25 N/m^2. Assume factor of safety = 2 and poisson ratio = 0.3. 10

3 A bolt is subjected to a direct tensile load of 25 kN and a shear load of 18kN. Suggest the suitable size of the bolt according to various theories of elastic failure, if the yield stress in simple tension is 390 MPa. Factor of safety = 3, Poisson ratio = .0.25 10

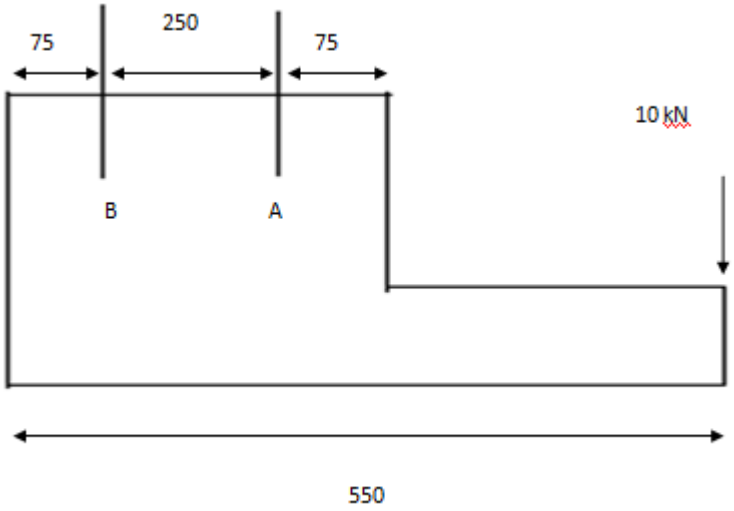
4 Why are square threads preferable to V threads for power transmission? 4

5 Two copper plates of thickness 20 mm are joined by M14 steel bolt with S_{yt} = 650 MPa. The initial preload on the bolt is 0.8 x A, where A is the area of the thread. For M14 bolt area of thread is 115 mm^2. The combined stiffness of plates is 1.7×10^6 N/mm. $E_{cu} = 1.05 \times 10^5$ N/mm^2 and $E_{steel} = 2x\ 10^5$ N/mm^2

a) Find the stiffness factor for the bolted joint.

b) Find the safe external load that can be applied safely on the joint in kN.

6 A C.I bracket, as shown in fig, supports a load of 10kN. It is fixed to the horizontal channel by means of four identical bolts, two at A and two at B. The bolts are made by steel, S_{yt} = 400 N/mm^2 and F.S = 6. Find the nominal diameter of bolt, d if d_c = 0.8 d.
All dimensions are in mm. 20



7 A M20 bolt has a shank of 50 mm length and a thread of 25 mm length. It is subjected to a tensile load of 25 mm length. It is subjected to a tensile load of 10 kN. Young's modulus of the bolt material is 205000 N/mm^2. d_c = 0.8 d. Find the strain energy stored in the bolt.
10

8 State and explain different types of threads with diagram. (Any four) 4

9 Explain 10

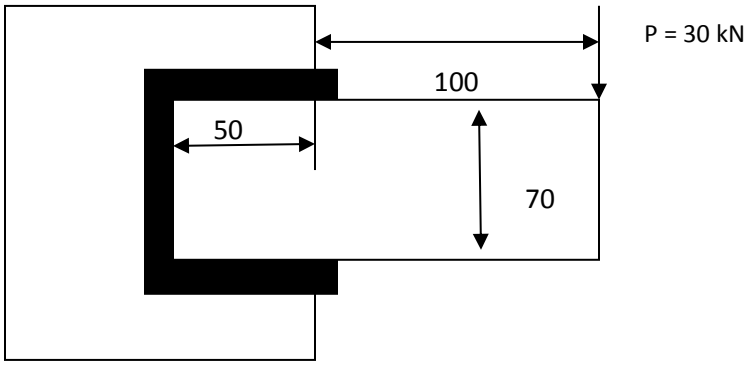
a) Fatigue stress concentration
b) Notch sensitivity

10 Two shaft are connected by means of a flange coupling to transmit torque of 25 Nm. The flanges of the coupling are fastened by four bolts of the same material at a radius of 30mm. Find the size of the bolts if the allowable shear stress for the bolt material is 30 MPa.
10

MODULE 4

1 a) Explain different types of welded joint with figure.
b) What are the advantages of preloading of bolts in a bolted joint? 10
c) Explain what is meant by reinforcement in welding

2 A bracket supporting a load of P = 30 kN is welded to a vertical member by four fillet welds as shown in figure. Calculate the size of the weld if the shear stress in the throat section is not to exceed 85 kN/mm^2.



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3 a) With neat sketch, explain caulking and fullering. 10
b) Explain buckling of compression springs.
c) Explain the stress distribution in welds.

4 Two flat plates subjected to a tensile force P are connected together by means of double riveted double strap zigzag pattern. The force P is 250kN and the width of the plate is 200mm. The rivets and plates are made of the same steel and the permissible stresses in tension, compression and shear are 70 N/mm2, 100 N/mm2 and 60 N/mm2 respectively. Calculate:

a) The diameter of the rivets;
b) The thickness of the plates;
c) The efficiency of the joint.

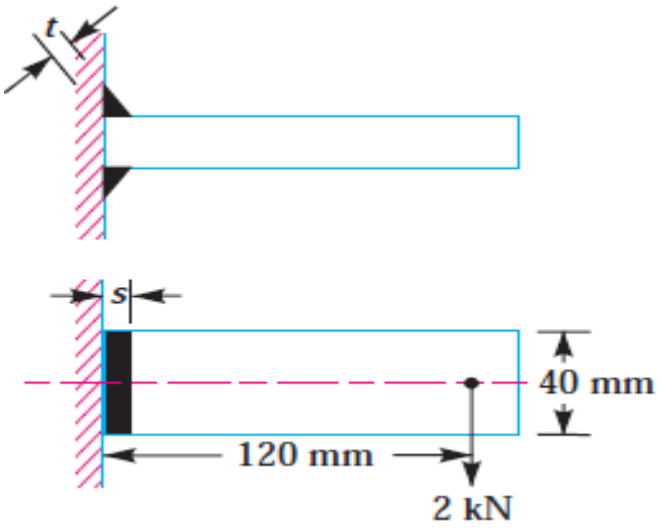
10

5 Discuss the modes of failure for a parallel fillet weld which is eccentrically loaded. 4

6 A circular bar 60 mm diameter is welded to a steel plate. A load of 1000 N acts at a distance of 200 mm. The bar acts as a cantilever. Determine the size of the weld if the stress developed should not exceed 80 N/mm^2. 10

7 A plate 100 mm wide and 12.5 mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of the weld so that the maximum stress does not exceed 56 MPa. Consider the joint first under static loading and then under fatigue loading. 10

8 A welded joint as shown in figure is subjected to an eccentric load of 2 kN. Find the size of the weld, if the maximum shear stress is 25 MPa. 10



9 A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25 mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension, 320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses in the plates and rivets. 10

10 A double riveted lap joint with zig-zag riveting is to be designed for 13 mm thick plates. Assume Maximum permitted tensile stress = 80 MPa, shear stress = 60 MPa and compressive stress = 120 MPa. State how the joint will fail and find the efficiency of the joint.

MODULE 5

1 A semi elliptical laminated, automobile spring to carry a load of 3kN is to consist of seven leaves 58 mm wide, two of the leaves extending the full length of the spring. The spring is to be 1080 mm in length and is to be attached to the axle by two U bolts 80 mm apart. These bolts clamp the central portion of the spring so rigidly that they may be considered equivalent to a band having width equal to the distance between the bolts. The leaves are to be made of silica-manganese steel. Assuming an allowable stress of 350 N/mm^2, determine the thickness for leaves and deflection. 20

2 Explain surge in springs. How this can be avoided? 4

3 Design a helical spring for a spring loaded safety valve for the following conditions:
Operating pressure = 1 N/mm^2
Maximum pressure when the valve blows off freely= 1.075 N/mm^2
Maximum lift of the valve when the pressure is 1.075 N/mm^2 = 6 mm
Diameter of valve seat = 100 mm
Maximum shear tress = 400 MPa
Modulus of rigidity = 86 kN/mm^2
Spring index= 5.5
20

4 A semi-elliptical laminated spring 900mm long 55 mm wide is held together at the centre by a band 50mm wide. If the thickness of each leaf is 5 mm, find the number of leafs required to carry a load of 4500 N. assume a maximum working stress of 490 MPa.
20

5 A semi laminated spring is required to support a central load of 400 N over an effective span of 915 mm. The width and thickness of each leaf are repectively 60 mm and 5 mm and permissible tensile stress in the material of the leaf is 475 MPa. The spring must have 2 full length leaves. Calculate the number of graduated leaves and deflection of spring under the load assuming the full length leaves are not pre-stressed.
Assume E = 200 x 10^3 MPa
20

6 Discuss how the stress is equalized in leaf springs. 4

7 A direct reading tension spring balance consists of a helical tension spring, which is attached to a rigid support at one end and carries masses at other free end. The length of scale is 100 mm, which is divided into 50 equal divisions. Each division indicates 0.5 kg. Maximum capacity of the balance is 25 kg. The spring index is 6. Assuming a suitable material design the spring and give the specifications.
20

8 A compression coil spring made of an alloy steel is having the following specifications:
Mean diameter of coil = 50 mm; wire diameter = 5 mm; number of active coils = 20.
If the spring is subjected to an axial load of 500 N; Calculate the maximum shear stress (neglect the curvature effect) to which the spring material is subjected. 10

9 A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm^2, find the axial load which the spring can carry and the deflection per active turn. 20

10 What do you mean by nipping in leaf spring? What is the use of nipping? 4

MODULE 6

1 Explain flexible coupling with their applications. 4

2 Calculate the maximum clearance and minimum interference and also mention the limits of the size for the hole and shaft for easy keying of coupling in the shaft for 50H7k6.
10

3 A shaft is supported by two bearings placed 1m apart. A 650 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.5 kN. Another pulley 450 mm in diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and $\mu = 0.24$. Determine the suitable diameter for solid shaft, allowing working stress of 70 N/mm^2 in tension and 45 N/mm^2 in shear for the material of the shaft. Assume that the torque on the pulley is equal to that on the other pulley.
20

4 Enumerate different types of keys. Derive the relation for the strength of a key. 10

5 A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50kN. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by; ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa.
20

6 A machine shaft supported on bearings having their centers 750 mm apart, transmitted 185kW at 600 r.p.m. A gear of 200mm and 200 tooth profile is located 250 mm to the right of left hand bearing and a

450 mm diameter pulley is mounted at 200 mm to right hand bearing. The gear is driven by a pinion with a downward tangential force while the pulley drives a horizontal belt having 1800 angle of contact. The pulley weighs 1000N and tension ratio is 3. Find the diameter of the shaft, if the allowable shear stress of the material is 60MPa. 20

7 Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15kW at 200 r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 20% greater than the full load torque. The shear stress of cast iron is 14 MPa. 20

8 Differentiate between a cotter and a key. 4

9 A pulley is keyed to a shaft midway between two anti-friction bearings. The bending moment at the pulley varies from -190 Nm to 530 Nm as the torsional moment in shaft varies from 60 Nm to 170 Nm. The frequency of the variation of the loads is the same as the shaft speed. The shaft is made of cold drawn steel having an ultimate strength of 545 MPa and yield strength of 400 MPa. Determine the required diameter for an indefinite life. The stress concentration factor for the keyway in bending ad torsion may be taken as 1.65 and 1.38 respectively. Assume design factor as 1.6. 20

10 A stepped shaft with the reduction ratio of 1.2 is to have a fillet radius of 10% of the smaller diameter. The material of the shaft has notch sensitivity factor of 0.9, a shear stress of 155 MPa at yield and a shear stress of 115 MPa at endurance limit. Determine the diameter of the shaft at the minimum cross section to sustain a twisting moment that fluctuates between 550 Nm to -850 Nm. Assume factor of safety as 2. 20

SUB CODE ME 405 SUBJECT NAME Refrigeration and Air Conditioning

MODULE 1

1. What is the function of a condenser in a thermal power plant?
2. What is super critical boiler?
3. What is the principle of Velox boiler? What are its advantages?
4. Write a short note on Loeffler boiler
5. Explain about Fluidized bed combustion boiler. What are the advantages of FBC?
6. What are steam turbines? What are the different types of steam turbines?
7. What is the working principle of Cooling towers
8. What is the use of pulveriser? What are the different types of pulverising mills?
9. What is IGCC? What are its advantages?
10. What is biological shielding?

MODULE 2

1. What are the limitations to harness solar energy?
2. What is a heliostat?
3. Write a short note on solar photovoltaic cell.
4. Define altitude angle and incident angle.
5. Distinguish between global and diffuse radiation
6. What is pyranometer
7. What is pyrheliometer
8. State the principle of solar thermo converters.
9. What is desalination?
10. What are the main components of a flat plate collector?
11. Explain the diffusion process briefly.

MODULE 3

1. What are the types of wind turbines?
2. What are the types of wind mills?
3. Write a short note on wind energy storage.
4. How are WEC systems classified?
5. Explain the site selection process for wind energy plant.
6. State the principle of kind conversion systems.
7. Define tip-speed ratio.
8. Define lift and drag forces of wind energy.
9. What are the types of wind machines?

10 How wind energy can be used for direct heat applications.

MODULE 4

1 What is biogas? What are the advantages of biogas?

2 What are the factors to be considered for the biogas plant site selection?

3 What is biomass conversion process?

4 What is gasification and liquefaction?

5 What is anaerobic digestion?

6 What is fermentation?

7 Explain the combustion of biogas plant

8 What is transesterification.

MODULE 5

1 What is micro hydro power plant?

2 What is a Turgo turbine?

3 What is an electronic load controller (ELC)?

4 What are load limiters?

5 What are the components of a tidal power plant?

6 What is Geo Thermal power? What are the sources of geothermal power?

7 What is OTEC? What are the types of OTEC?

8 What is a fuel cell? What are the advantages and disadvantages?

9 What is the working principle of MHD power plant?

10 Define plant capacity factor.

11 Define diversity factor.

12 Write about power tariffs.

13 What is a load duration curve?

MODULE 6

1 What are the methods to reduce the effects of particulates?

2 What are the equipments used for ash collection?

3 What is meant by desulphurisation and name the methods adopted for desulphurisation?

4 What are the methods adopted to remove SO2 from flue gases?

5 Write about waste water boiler.

6 What are the major pollution from a thermal power plant?

7 How to control particulate matter?

8 What is Indian boiler Act?

9 What are the main provisions of Indian boiler act?

10 Define thermal efficiency of the boiler.

11 What is meant by boiler trail?

12 Explain greenhouse effect.

13 What is ozone layer depletion?

14 What is acid rain?

15 What is meant by biodiversity?

SUB CODE ME 405 SUBJECT NAME Refrigeration and Air Conditioning

MODULE 1

1. Define COP and Relative COP.
2. Explain ice refrigeration
3. Define DART
4. Define tonnes of refrigeration
5. Enumerate the various applications of refrigeration.
6. Explain the limitations of a carnot cycle.
7. Sketch the P-v and T-s diagram of a reversed carnot cycle
8. Sketch the P-v and T-s diagram of a bell – colemann cycle.
9. Sketch the T-s diagram of a bootstrap air refrigerating system.
10. What are the merits and demerits of air refrigeration system?
11. Which air refrigeration system will be preferred for cooling at exceptionally very high speeds? Justify.
12. Sketch the T-s diagram of a simple air refrigerating system. 13. Sketch the T-s diagram of a reduced air refrigerating system. 14. Sketch the T-s diagram of a regenerative air refrigerating system. 15. Differentiate between a heat pump, refrigerator and heat engine
13. Sketch the T-s diagram of a reduced air refrigerating system
14. Sketch the T-s diagram of a regenerative air refrigerating system.
15. Differentiate between a heat pump, refrigerator and heat engine

MODULE 2

1. Explain with the help of a neat sketch, the principal and working of a vortex tube refrigerator.
2. Explain with the help of a neat sketch, the principal and working of an adiabatic demagnetisation refrigerator
3. Explain with a neat sketch, the working of a Joule cycle for refrigeration. Sketch its P-v and T-s diagrams.
4. What is a LSHX?
5. Explain the role of a receiver in a VCRS
6. Draw the P-h and T-s diagram of a simple VCRS.
7. Enumerate various methods to improve the COP of a VCRS.
8. Compare superheating with under cooling in a simple VCRS.
9. Compare Compound VCRS over simple VCRS.
10. Draw P-h and T-s diagram for an actual VCRS
11. A VCRS works on dry compression cycle using R-12 as refrigerant. It operates between the temperature limits of 40^{o}C and -5 ^{o}C. Find the COP and power requirement

12 Explain the factors affecting the COP of a VCRS with the help of suitable sketches.

13 An ammonia refrigerating machine has a working temperature of 35oC and -15oC. Assume two cases: a) Wet compression; b) Dry compression. Calculate for each case: i. Theoretical piston displacement per tonnes of refrigeration ii. Theoretical horse power per tonnes of refrigeration iii. COP

14 A VCRS uses R-12 as refrigerant works between 10oC and -15oC. If the temperature of vapour at the end of compression is 15oC. Find its COP: i. There's no undercooling ii. Undercooling by 5oC before the refrigerant enters the expansion valve.

15 Explain different methods to improve the COP of VCRS with neat line sketches

MODULE 3

1)Enumerate the applications of various refrigerants

2 Briefly explain the properties required for an ideal refrigerant

3 List the advantages and limitations of VARS.

4 List the advantages of Electrolux refrigerator.

5 List the requirements for an ideal refrigerant-adsorbent mixture.

6 List the applications of steam jet refrigeration

7 Compare VARS with VCRS

8 Explain with a neat sketch, the working of simple VARS (simple aqua-ammonia system).

9 Explain the working of Li-Br refrigeration system

10 Explain the principal and working of a steam jet refrigeration system with a neat sketch

MODULE 4

1 Explain the need for cooling towers in AC systems?

2 Differentiate between a hermetically sealed and a semi-hermetically sealed compressor.

3 List the applications of centrifugal compressors?

4 Classify evaporators and condensers.

5 Explain the working of a domestic refrigerator.

6)Explain various food freezing techniques

7)List the various refrigerant leakage detection techniques

8 Explain the different types of cooling towers used for refrigeration with neat sketches

9 Explain the different types of compressors used for refrigeration with neat sketches

10)Explain the different types of expansion devices used for refrigeration

11 Explain the function of a condenser in refrigeration system. Explain in detail the working of an evaporative condenser with a neat sketch

SUB CODE ME 405 SUBJECT NAME Refrigeration and Air Conditioning

MODULE 5

1. Define industrial and comfort air conditioning.
2. Define DBT, WBT and DPT
3. Define bypass factor
4. Define humidity ratio and saturation ratio
5. Enumerate different factors affecting human comfort.
6. Explain absolute humidity and DPT
7. What is effective temperature?
8. What are the factors affecting effective temperature
9. Explain SHF. Draw GSHF in a psychrometric chart.
10. Describe different methods for air conditioning duct design.
11. Briefly describe air distribution system for air conditioning system.
12. Explain RSHF and GSHF.
13. Represent different psychrometric process in a psychrometric chart.
14. Comment on saturated and unsaturated air in psychrometry.
15. How effective temperature is significant in designing of air conditioning systems. Draw a comfort chart

MODULE 6

1. Explain in detail adiabatic saturation process. Obtain an expression for adiabatic WBT.
2.)Explain different types of psychrometers used with the help of neat sketches
3. Distinguish between the working of summer, winter and year around air conditioning system with the help of neat sketches.
4. Define and obtain an expression for bypass factor of a cooling coil
5. Represent following process in a psychrometric chart and explain how achieve them. i Heating and dehumidification ii Cooling and humidification iii Humidification iv Sensible heating
6. Mention advantages and disadvantages of split AC system
7. What are important factors considered in cooling load calculations. Explain in detail
8. What are the factors to be considered in designing air conditioning systems for hospitals and cinema theatre?
9. Describe in detail Unitary, spilt and centralised air conditioning systems with neat figures.
10. Specify on configurational differences among summer, winter and year around air conditioning system
11. How effective temperature is significant in designing of air conditioning systems. Draw a comfort chart.