Seat No.

B. Tech. (Mechanical) (Part - IV) (Semester - VII) (CBCS)
Examination, January - 2023
AUTOMOBILE ENGINEERING
Sub. Code : 83717

Day and Date : Saturday, 14 - 01 - 2023   Total Marks: 70
Time : 10.30 a.m. to 01.00 p.m.

Instructions: 1)   All the questions are compulsory.
                 2)   Figures to the right indicate full marks.
                 3)   Use of non programmable calculator is allowed.

Q1) Attempt any two from the following. (12 Marks)

    a)   Draw the layout of the automobile vehicle in general showing important Components. **[6]**

    b)   Explain the difference between front engine front wheel drive and front engine rear wheel drive. **[6]**

    c)   Explain the types of Frames with neat sketch. **[6]**

Q2) Attempt any two from the following. (12 Marks)

    a)   Explain fluid flywheel with neat sketch and state its advantages. **[6]**

    b)   Explain Synchromesh gear box in detail. **[6]**

    c)   What is the need of gear box in automobile? Explain the final drive. **[6]**

Q3) a)   Explain in detail power steering system. **[5]**

    b)   Explain the function, principle of Davis Steering mechanism. **[6]**

OR

    c)   Explain hydro gas suspension. **[6]**

P.T.O.

Q4) Attempt any two from the following. (12 Marks)

    a)   Explain Electronic Brake Distribution (EBD).   **[6]**

    b)   What are various types of brakes? Compare drum brakes with disc brakes.   **[6]**

    c)   Explain wheel construction and alloy wheel.   **[6]**

Q5) Attempt any two from the following. (12 Marks)

    a)   Explain with neat sketch working of magneto ignition system. compare with battery ignition system.   **[6]**

    b)   Draw Full layout diagram of an Automotive Air Conditioning system and Explain function of each components and working of system?   **[6]**

    c)   What are the different tests carried out to check the performance of the battery.   **[6]**

Q6) a)   Explain Air resistance, Rolling Resistance, Gradient Resistance to the vehicle motion.   **[5]**

    b)   Write a note on Electronic Stability Program.   **[6]**

OR

    c)   Standing on a gradient of 1 in 10 width mass of 810 kg how much Distance a motor vehicle would travel in 30 seconds when hand brakes are released. Rolling resistance is 1 % of its mass. Find is its final speed?   **[6]**

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B.Tech. (Part - IV) (Semester - VII) (CBCS) Examination, January-2023

REFRIGERATION AND AIR CONDITIONING

Sub. Code : 83712

Day and Date : Friday, 6 - 01 - 2023   MECH·

Time : 10.30 a.m. to 1.00 p.m.

Total Marks : 70

Instructions :
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of charts & steam table is allowed.
4) Assume suitable data if necessary & mention it clearly.
5) Draw neat diagrams wherever necessary.

Q1) Solve any two.

a) A cold storage is to be maintained at -6°C while the surrounding temperature at 38°C. The heat leakage from the surroundings into the cold storage is estimated to be 30kW. The actual COP of the refrigeration plant is 1/3 of an ideal plant working between the same temperatures. Find the power required to drive the plant. **[6]**

b) Differentiate clearly between a Heat Engine, Refrigerator and Heat Pump. **[6]**

c) Enlist the methods of refrigeration. Explain in detail with neat sketch any one of them. **[6]**

Q2) Solve any two.

a) State the various methods of air refrigeration used for aircraft. Describe simple cooling system for aircraft. **[6]**

b) Explain the following.

i) Dry V/s Wet Compression

ii) Throttling V/s Isentropic Expansion. **[6]**

c) With the help of line diagram, explain the working of a Claude System. **[6]**

P.T.O.

Q3) Solve any two.

    a)   Describe the desirable properties of good refrigerant.   **[6]**

    b)   What is the function of Compressor in Vapour Compression Refrigeration System (VCRS) and enlist different types compressors used in VCRS.   **[6]**

    c)   Explain application of Refrigeration in Dairy Plant.   **[6]**

Q4) Solve any two.

    a)   What is moist air? Derive an expression for enthalpy of moist air.   **[6]**

    b)   Derive the relation between relative humidity and degree of saturation.**[6]**

    c)   Enlist the different Psychrometric Processes used in Air-conditioning.**[6]**

Q5) Solve any two.

    a)   What are the different types of heat loads in load estimation for comfort application?   **[6]**

    b)   Explain RSHF, GSHF & ESHF and their utility in the air-conditioning practices.   **[6]**

    c)   Explain with neat sketches summer and year-round air conditioning systems.   **[6]**

Q6) Write short note on - (any two)   **[10]**

    a)   Inverter Technology used in Air Conditioning.

    b)   Energy Conservation in HVAC.

    c)   Car Air Conditioning.

    d)   Green Building.

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Seat No.

# January - February (Winter) Examination - 2023

Subject Name: B.Tech. CBCS_83713_Mechanical System Design_09.01.2023_10.30 AM To 01.00 PM

Subject Code: 83713

Day and Date: Monday, 09-01-2023

Time: 10:30 am to 01:00 pm

Total Marks: 70

Q.1.   a) Explain aspects like Form (Shape) and Morgan's color code used in the   [11]
aesthetic of product design. (5 Marks)

   b) Explain the various steps involved in Creativity in Design. (06Marks)

or

b) With the help of a neat sketch explain the ergonomic design consideration
involved in the design of the Bi-cycle.   (06Marks)

Q.2.   a) Explain the types of stresses developed in thin cylinders subjected to   [13]
internal pressure with neat sketches. (05 Marks)

or

   a) Explain the types of end closures used in the unfired pressure vessel
with neat sketches. (05 Marks)

b) An air receiver consists of a cylinder closed by hemispherical ends as shown
in Figure below. It has a storage capacity of 0.25 m3 and an operating internal
pressure of 5 MPa. It is made of plain carbon steel 10 C4 (Sut = 340 N/mm2)
and the factor of safety is 4. Neglecting the effect of welded joints determines
the dimensions of the receiver.   (08Marks)

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**Q.3.**   [11]
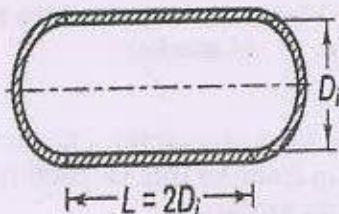
a) Explain various types of friction materials used for clutches. (04marks)

b). A centrifugal clutch, transmitting 20kW at 720 rpm, consists of four shoes. The clutch is to be engaged at 75% of the running speed. The inner radius of the drum is 170 mm, while the radius of the center of gravity of each shoe, during the engaged position, is 140mm. co-efficientient of friction is 0.25. Calculate the mass of each shoe.   (07Marks)

or.

b)An automotive-type internal expanding brake is shown in the figure below. The face width of the friction lining is 50mm and the coefficient of friction is 0.4. The maximum intensity of pressure on the lining is 0.8 N/mm2.The angle θ_1 can be assumed to be zero.
Calculate.
1. The actuating force.
2. The Braking Torque Capacity   (07Marks)
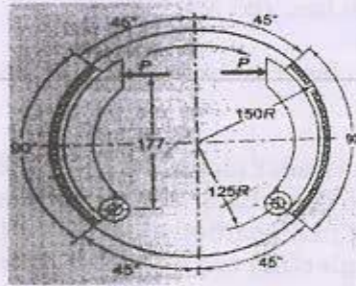
Q.4.   a) what are the considerations in the design of multi-speed gearboxes? (4   [13]
marks)

Or

a)What is a structure diagram? Explain the procedure to construct a structure diagram for a multispeed drive.   (4 marks)

b) A multi-speed gear box is to be designed for a headstock of a turret lathe for nine spindle speeds ranging from 30 rpm to 1000 rpm.If the gearbox is driven by 5KW, 720 rpm electric motor;
(i)Draw the speed ray diagram.
(ii) Draw the gearing diagram.
(iii)Determine the number of teeth on gears.
Assume same module for all gears.   (09marks)

Q.5. a). Explain briefly the Guidelines for the design of piston Rings. (05 marks) [11]

b) Determine the small and the big end bearings of the connecting rod for a diesel engine with the following data:
(i)Cylinder Bore = 150mm
(ii)Maximum gas pressure = 5 Mpa
(l/d) the ratio for piston pin bearings = 2
(l/d) ratio for crank pin bearing =1.4
Allowable bearing pressure for piston pin bearing = 15 Mpa
Allowable bearing pressure for crank pin bearing = 10 MPa. (06 marks)

or

b) The following data is given for a connecting rod:
Engine speed =2000rpm.
Length of connecting rod =400mm.
Length of stroke = 200mm.
Density of material =7800 kg/m3
The thickness of web or flanges = 10 mm
Assume the cross-section of the connecting rod as shown in the figure below with the area of the cross-section, Calculate the whipping stresses in connecting rod. (06 marks)

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

Q.6.   a). Guidelines during selection of Material Handling System (MHS)   [11]
or

a) Explain briefly Conveyors and its types. (05 marks)

b). An inclined belt conveyor is used for loading the mineral ore in a ship. The belt inclination is 30degree for which the flow ability factor 'k' is 2.0x10-4. the belt width is 1000 mm while the belt speed is 2.5 m/sec.if the specific weight of the mineral ore is 14000N/m3, determine the capacity of a conveyor. (06 marks)

Seat
No.

B. Tech. (Mechanical) (Semester - VII) Examination, January - 2023
FINITE ELEMENT ANALYSIS
Sub. Code : 83714

Day and Date : Wednesday, 11 - 01 - 2023   Total Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions :
1) All questions are compulsory.
2) Use of non-programmable calculator is allowed.
3) Assume suitable data if necessary & state it clearly.
4) Figures to the right indicate full marks.

Q1) Attempt any two from the following:

    a) How can an FEA problem be simplified through symmetry? Explain with proper sketches.   **[6]**

    b) What are the properties of Global Stiffness matrix?   **[6]**

    c) Write a note on past, present and future of FEA.   **[6]**

Q2) a) Explain and discuss one Dimensional heat transfer in thin films.   **[6]**

    b) Derive an expression of Shape function of 1D Linear element.   **[6]**

OR

    b) Derive an expression of Stiffness Matrix of 1D Linear element.   **[6]**

Q3) a) List down and briefly explain the elements for two dimensional elements used in FEA.   **[6]**
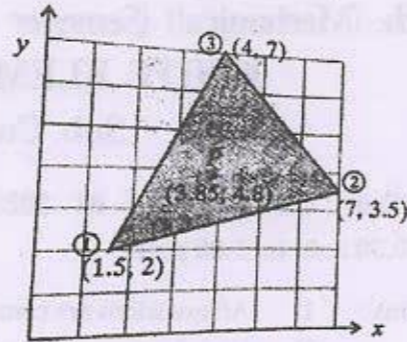
OR

    a) Discuss what is Plane stress and Plane strain conditions with example.**[6]**

P.T.O.

b) Evaluate the shape function N1, N2 and N3 at the interior point P for the triangular element shown in the figure. [6]

**Q4) a)** Give the applications of axisymmetric elements. [6]

OR

a) Discuss displacement functions for axisymmetric element. [6]

b) A long cylinder of 80 mm internal diameter and 120 mm external diameter snugly fits in a hole over its full length. The cylinder is then subjected to an internal pressure of 2 MPa. Draw the sketch showing actual problem and also model the problem for a sample length of 10 mm using two asisymmetric triangular elements with proper forces and boundary conditions. Also show the element connectivity table and coordinates of all nodes. [6]

Q5) a) Discuss the general steps involved in the analysis of truss. [6]

OR

a) Discuss properties of Stiffness matrix related with truss element. [6]

b) Analyse the following truss completely for Stress. The cross sectional area of each member of truss is 100 mm^2. Modulus of elasticity, E = 200 GPa for each element. Lenghts are in mm. [6]

-2-
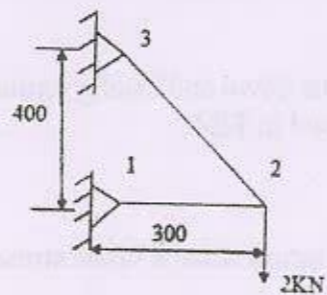
**Q6) a)** Explain and discuss two dimensional heat transfers with help of triangular element. [4]

OR

a) Explain with a neat sketch the boundary conditions for a two dimensional steady state heat conduction problem. [4]

b) A composite wall, with three layers of different material as shown in fig. has the following properties for the different layers. [6]

Layer - 1 Concrete slab $K_1 = 1.2$ w/m°c, $x_1 = 15$ cm & q = 15 w/m^2

Layer - 2 Fibre glass $K_2 = 0.0332$ w/m°c, & $x_2 = 5$ cm

Layer - 3 Gypsum $K_3 = 0.05$ w/m°c, & $x_3 = 1$ cm

$h = 15$ w/m^2°c and $T_a = 25$°c
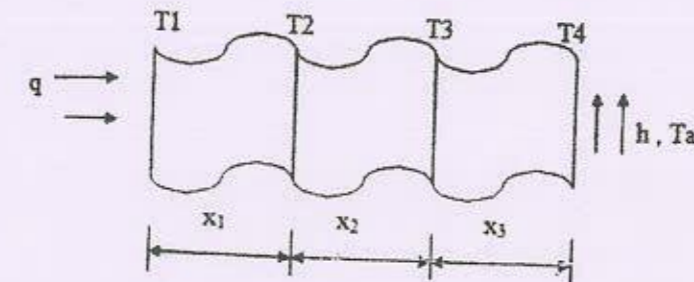
Calculate the temperature T1, T2, T3 and T4 assuming unit area of heat flow.

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