Seat No.

T.Y. B.Tech. (Mechanical) (Part- III) (Semester - V) (CBCS)
Examination, January - 2023
CONTROL ENGINEERING
Sub. Code: 80753
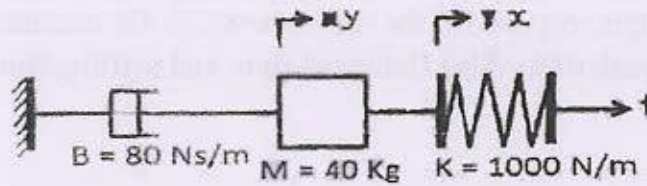
Day and Date : Friday, 13 - 01 - 2023   Total Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions :   1)   All questions are compulsory.
   2)   Assume suitable data, if required and mention it clearly.

Q1) a)   Explain force current analog   **[4]**

      b)   Determine relation between f and x for figure as shown below   **[4]**

B = 80 Ns/m   M = 40 Kg   K = 1000 N/m

      c)   Write in brief mathematical model of mechanical rotational system.   **[2]**

Q2) a)   For subsonic flow of air through a restriction, the mass flow rate is given

by, $M = 1.05 A \sqrt{\dfrac{(P_1 - P_2)P_2}{T}}$. The area of restriction A and the

temperature T are constants. Determine the linear approximation for mass flow rate due to change in pressure drop $(p_1 - p_2)$ and due to a change p_2 in the downstream pressure.   **[6]**

b) Reduce the following block diagram as shown in figure 2b & find the transfer function **[6]**
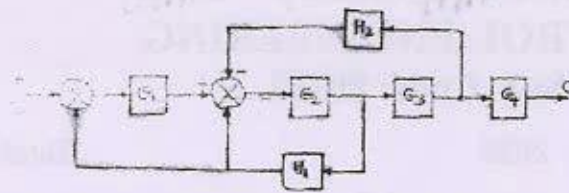
Q3) a) A DC position control system is as shown in figure. Determine the response $c(t)$ when $r(t) = 5u(t)$, $d(t) = 0$ **[6]**
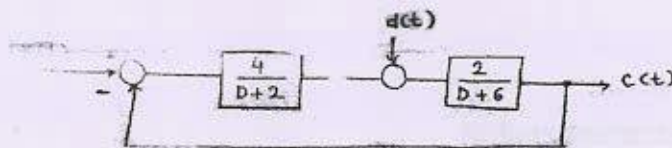
b) A unity feedback control system is having forward transfer function $G(S) = k/s(Ts+1)$ It is subjected to unit step response. Determine the value of k and T, if output response of the curve shows 25.4% maximum overshoot at 3 second peak time. Also find peak time and settling time. **[6]**

Q4) a) Sketch the Root locus for the system. **[8]**

$$G(s) = \frac{K}{S^3 + 3S^2 + 3S - 7}$$

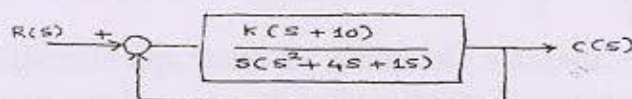b) For the system shown in fig 4b, determine the range of values of K such that the system is stable. **[4]**

fig. 4 b

-2-

Q5) a) For $G(s) = 170\ (0.1s+1)\ /s\ (1+s/1.75)\ (1+s/60)$ sketch the bode plot. **[8]**

b) In above question (Q5 A) find phase margin, gain margin and comment on stability of the system. **[4]**

Q6) a) Determine state space representation and computer diagram by using general programming. **[6]**

$$y(t) = \frac{D+3}{D^3+9D^2+24D+20}\ f(t)$$

b) Determine state space representation and computer diagram by using direct programming. **[6]**

$$y(t) = \frac{1}{(D+2)(D+3)}\ f(t)$$

✩✩✩

Seat
No.

T.Y.B.Tech. (CBCS) (Mechanical) (Part - III) (Semester - V)
Examination, January - 2023
ENTERPRISE RESOURCE PLANNING (Open Elective)
Sub. Code : 80762

Day and Date : Friday, 27 - 01 - 2023   Total Marks : 70

Time : 10.30 a.m. to 01.00 p.m.

Instructions: 1)   All questions are compulsory
                 2)   Figures to the right indicate full marks

Q1) Solve any two.   [12]
   a)   Discuss in brief how the business integration is achieved by ERP system.
   b)   What are the reasons for growth of ERP market.
   c)   Discuss in brief various tangible and intangible benefits of ERP system.

Q2) Solve any two.   [12]
   a)   What is BPR (Business Process Reengineering)? Discuss the advantages and Limitations of BPR.
   b)   Write brief account on Online Analytical Processing (OLAP).
   c)   Explain in detail about following terms in ERP environment
         i) Data Warehousing ii) Data mining

Q3) Solve any two.   [12]
   a)   Discuss in brief the significance of MRP in modern manufacturing. Discuss closed loop MRP.
   b)   Discuss role of CAD/CAM in ERP?
   c)   Discuss in brief the working and advantages of PDM.

Q4) Solve any two.   [12]
   a)   Explain the functions, subsystems and features of HR module?
   b)   Explain quality management module functions and give brief note on Computer integrated Quality Management (CIQ)
   c)   What are the various activities involved in material management? Discuss in brief how they are incorporated in ERP.

Q5) Solve any two. [12]

 a) What is the importance of ERP team training at various implementation stages?

 b) Enlist the different phases sequentially of the ERP implementation life cycle and explain project planning phase and gap analysis phase.

 c) Who are end users and why they so critical for success of ERP implementation?

Q6) Solve any two. [10]

 a) Explain the role of E-commerce in ERP

 b) Which companies are called 'Big-5' in ERP market and why?

 c) Current ERP market scenario in India.

○○○○

Seat
No.

T.Y. B.Tech. (Mechanical) (Part - III) (Semester - V) (CBCS) Examination, January - 2023
HEAT AND MASS TRANSFER
Sub. Code : 80755

Day and Date : Thursday, 19 - 01 - 2023
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) Assume if necessary suitable data and state clearly.

Q1) Solve any two : [12]
a) What are the modes transfer & explain Ficks law of diffusion.
b) State Newton's law of cooling and define convective heat transfer
c) A plane wall is 15 cm thick of surface area 4.5 m². Thermal conductivity of wall is 9.5 W'm K. The inner and outer surface temperatures of the wall are maintained at 150°C and 45°C respectively. Determine heat flow across wall and temperature gradient in the heat flow direction.

Q2) a) Explain lumped heat capacity analysis. Also give the Physical Significance of Fourier's number.
b) Rate of heat generation in the plane wall of thickness 10 cm is 1.5×10^5 W/m³. One side of the wall is insulated while the other is exposed to a fluid of temperature 100° C where heat transfer coefficient is 500 W/m³K. Thermal conductivity of wall is 15 W/mK. Determine maximum temperature in the wall. [12]

Q3) Solve any two : [12]
a) What do you understand by overall fin effectiveness?
b) Derive the expression for temperature distribution for a short fin with Convective tip.
c) An aluminum rod 2 cm diameter and 10 cm long protrudes from the wall mentioned at 300° C. The rod is exposed to surrounding 15° C. Heat transferred coefficient between rod surface and environment is 20 W/m² K. The thermal conductivity of the material is 200 W/mK. Find total heat dissipated by rod. Assume that the rod end is insulated.

P.T.O.

Q4) a) What do you understand by convection ?State the types of heat convection and differentiate between them.

b) Air at 10° C flows over a plate 1 m wide and 2 m long at a velocity of 100 m/s. Fan is placed before the plate so that flow of air is turbulent upstream over the plate find thickness of boundary layer. **[12]**

[12]

Q5) Solve any two :

a) Explain various types of emissivity of grey surfaces.

b) Explain the following terms

    i)   Black body.

    ii)   Grey body.

    iii)   Opaque body.

c) Consider a blackbody at the temperature of 2000K

    i)   Calculate its total hemispherical emissive power.

    ii)   Calculate the Wavelength at which maximum emissive power is available from this body.

[10]

Q6) Solve any two :

a) What is shell and tube heat exchanger? Why baffles are used?

b) Derive an expression for effectiveness of Counter flow heat exchange in terms of NTU.

c) Define the following term related to heat exchanger:

    i)   Effetiveness

    ii)   Fouling factor

    iii)   LMTO

ۿۿۿۿ

-2-

Seat No.

T.Y.B.Tech. (Mechanical) (Part-III) (Semester - V) (CBCS)
Examination, January - 2023
MANUFACTURING ENGINEERING
Sub. Code : 80757

Day and Date : Tuesday, 24 - 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)   Draw neat labeled diagram wherever necessary.

Q1) Solve any two   **[12]**

a)   Compare orthogonal cutting v/s oblique cutting.   **[6]**

b)   Derive an expression for relation between cutting velocity, Shear velocity and chip velocity.   **[6]**

c)   In orthogonal cutting operation following observations were made cutting force=158 kg, feed force=68kg, rake angle=7°,   **[6]**

Chip thickness ratio r=0.4, calculate

i)   Coefficient of friction,

ii)   shear force,

iii)   Normal to shear force

Q2) Solve any two   **[10]**

a)   What is tool life? Explain various methods of expressing tool life.   **[5]**

b)   A 60 mm diameter bar was machined at 280 rpm, tool life observed was 15 minutes speed was changed to 240 rpm, tool life observed was 30 minutes, find cutting speed for 20 minutes tool life.   **[5]**

c)   Discuss factors affecting tool life.   **[5]**

P.T.O.

Q3) Solve any two: [10]

a) Explain objective of good tool design. [5]

b) Explain cutting fluid; discuss various properties of cutting fluid. [5]

c) Explain tool geometry of reamer with neat sketch. [5]

Q4) Design and draw neat dimensional sketch in two views with one sectional view of suitable drilling jig to drill two holes of M14 at 60 ± pcd shown in fig., show details of location, clamping and bushes. This is last operation. [16]

OR

Design and draw neat dimensional sketch in two views with one sectional view of milling fixture, to face mill surface marked as shown in fig., show details of location, clamping and cutter setting. This is last operation.

Fig.
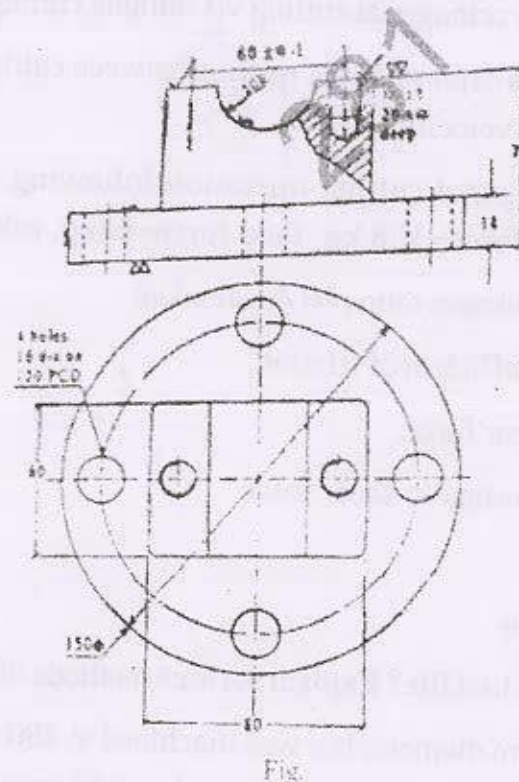
Q5) Solve any two [12]

a) A washer with 12.7 mm hole and 25.4mm outside diameter is to be made from 1.5 mm thick strip of 0.2% carbon steel. considering elastic recovery of material. find [6]

   i) The clearance,

   ii) Piercing punch size,

   iii) Piercing die opening size.

b) What are the different press working operations? [6]

c) Write a note on [6]

   i) Inverted die

   ii) Strippers and knockout used in press work.

Q6) Solve any two [10]

a) Explain various tool changing facilities. [5]

b) Compare CNC machine over NC machine. [5]

c) Explain modular tooling system. [5]

● ● ●

T. Y. B.Tech. (Mechanical) (Part - III) (CBCS) (Semester - V) Examination, January - 2023
THEORY OF MACHINES - II
Sub. Code : 80754

Day and Date : Tuesday, 17 - 01 - 2023

Time : 10.30 a.m. to 01.00 p.m.

Total Marks : 70

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

Q1) a)   Compare between involute profile and cycloidal profile gears.   [4]

OR

Derive the law of gearing.

b)   A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio and the maximum velocity of sliding if the pinion rotates at 100 rpm.

[8]

Q2) a)   Explain the working of differential gear of an automobile.   [4]

OR

Explain the torques in epicyclic gear train.

b)   Two spur gears A and B of an epicyclic gear train as shown in fig. 2b have 24 and 30 teeth respectively. The arm rotates at 100 rpm in the clockwise direction. Find speed of gear B on its own axis, when the gear A is fixed. If instead of being fixed, the wheel A rotates at 200 rpm in the counter clockwise direction, what will be the speed of B?   [8]
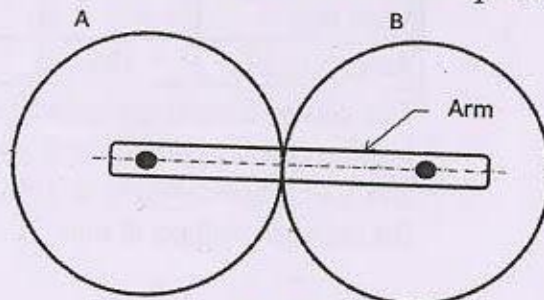

Fig. 2b

P.T.O.

Q3) a) Draw gyroscopic couple figure and define the following terms: Axis of spin, processional angular motion and axis of precession. [4]

OR

Explain the effect of gyroscopic couple on ship during steering and pitching.

b) A two wheeler of 350 mm wheel radius is negotiating a turn of radius 70 m at speed of 100 km/h. The combined mass of vehicle with its rider is 250 kg. The C. G. of rider is 0.6 m above ground level. The mass moment of inertia of engine flywheel is 0.30 kg – m² and moment of inertia of each road wheel is 1 C. G. of rider is 0.6 m above ground level. The mass moment of inertia of engine flywheel is 0.30 kg – m² and mom t of inertia of each road wheel is 1 kg – m². If the speed of the engine is five time the speed of the wheel and in the same direction, find angle of heel of vehicle. [8]

Q4) a) What conditions are to satisfied for a system to be dynamically equivalent to a given system. [6]

OR

Explain different types of dynamic forces acting in single slider crank chain mechanism.

b) The crank and connecting rod of a steam engine are 0.3 m and 1.5 m in length. The crank rotates at 180 rpm clockwise. Determine the velocity and acceleration of the piston when the crank is at 40 degrees from inner dead Centre position. [6]

Q5) a) Explain balancing of several masses rotating in same plane. [4]

OR

Why is balancing necessary for rotors of high speed engines?

b) Four masses A, B, C and D as shown below are to be completely balanced.

	A	B	C	D
Mass (kg)	-	30	50	40
Radius (mm)	180	240	120	150

The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°. B and C make angles of 210° and 120° respectively with D in the same sense. Find the magnitude and the angular position of mass A [8]

-2-

Q6) a) Explain maximum fluctuation of energy and coefficient of fluctuation of energy. [4]

OR

Explain Turning moment diagram for a single cylinder double acting steam engine.

b) The turning moment diagram for a petrol engine is drawn to the following scales : Turning moment, 1 mm = 5 N-m ; crank angle. 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295. 685, 40, 340, 960. 270 mm² . The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m. [6]

▽ ▽ ▽ ▽

-3-

Seat
No.

T.Y.B.Tech. (Mechanical) (Semester - V)
Examination, January - 2023
MACHINE DESIGN - I
### Sub. Code: 80756

Day and Date: Saturday, 21 - 01 - 2023   **Total Marks : 70**
Time : 10.30 a.m. to 1.00 p.m.

Instructions :   1)   All questions are compulsory.
                 2)   Figures to the right indicates full marks.
                 3)   Use of non programmable calculator is permitted.
                 4)   Draw neat diagrams wherever necessary.

Q1) a)   What are the important theories of elastic failures?   **[6]**

     b)   Summarize the guidelines for the selection of quantitative values of factor
         of safety.   **[5]**

Q2) a)   Explain the design procedure for a turn-buckle with the help of neat
         sketch.   **[6]**

     b)   Discuss the design of a bell -crank lever.   **[6]**

Q3) a)   Discuss the design procedure for square key.   **[4]**

     b)   The layout of an intermediate shaft of a gear box supporting two spur
         gears B and C is shown in Fig. The shaft is mounted on two bearings A
         and D. The pitch circle diameters of gears B and C are 900 and 600 mm
         respectively. The material of the shaft is steel FeE 580 (Sut=770 and
         Syt=580 N/mm2). The factors kb and kt of ASME code are 1.5 and 2.0
         respectively. Determine the shaft diameter using athe ASME code. Assume
         that the gears are connected to the shaft by means of keys.   **[8]**
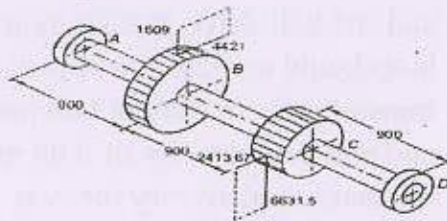
Q4) a) Describe the design procedure of the bolts subjected to eccentric loading acting perpendicular to the axis of bolts. **[5]**

b) A bracket is welded to the vertical plate by means of two fillet welds as shown in fig.no.4.1. Determine the size of the weld, if the permissible shear stress is limited to 70 N/mm² **[6]**
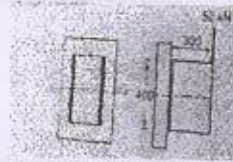
Fig.no.4.1

Q5) a) What are the stresses induced in helical spring of circular cross section? Explan with neat sketch. **[5]**

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 N/mm² and modulus of rigidity is 84 KN/mm². Also draw neat sketch of the spring. Take whals factor as $K = (4C-1/4C-4) + (0.615/C)$ **[6]**

The std wire gauge (SWG) number and corresponding diameter of spring wire is given in following table.

SWG	1	2	3	4	5
Diameter	7.620	7.010	6.401	5.893	5.385

Q6) a) Give in steps the procedure for selection V-belt from manufacturer's catalogue. **[5]**

b) It is required to select a flat belt drive to connect two transmission shafts rotating at 360 rpm which is driven by 10 KW, 1440 rpm motor. The center to center distance between the shafts is approximately is 2 m and the belt drive is open type. The load correction factor is 1.2. The belt should operate at a velocity between 17.8 to 22.90 m/s. The power transmitting capacity of belt per mm width per ply at 180° arc of contact and at a belt velocity of 5.08 m/s is 0.0118KW. Select preferred pulley diameters and specify the belt. (Reforsence data sheet is attached) **[8]**

Date:

Load correction factor (F_a)

	Type of Load	F_a
i)	Normal Load	1.0
ii)	Steady load, e.g. centrifugal pumps-fans - light machine tools - conveyors	1.2
iii)	Intermittent load, e.g. heavy duty fans- blowers- compressors-reciprocating pumps-line Shafts-heavy duty machines	1.3
iv)	Shock load, e.g. vacuum pumps-rolling mills-hammers-grinders	1.5

Arc of contact facotor (F_d)

α_s (degrees)	120	130	140	150	160	170	180	190	200
F_d	1.33	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.94

Standard widths of these belts (in mm)

3 - Ply	25	40	50	63	76				
4 - Ply	40	44	50	63	76	90	100	112	125	152
5 - Ply	76	100	112	125	152				
6 - Ply	112	125	152	180	200				

☆☆☆