Auto / IV / CBGS / IE / 13/06/2017

T0524 / T1023 INDUSTRIAL ELECTRONICS

Q.P. Code:18099

(3 Hours) [Total Marks: 80]

N.B: (1) Question no.1 is **compulsory**
(2)Solve any **three** from remaining questions
(3)Assume **suitable** data if **necessary**
(4)**Figures** to the right indicate full marks

1. Solve any 4: 20
   (a) List the characteristics of an ideal op-amp.
   (b) Illustrate the VI characteristics of SCR and DIAC.
   (c) State and prove De Morgan's theorems.
   (d) What is linear actuator motor? Enlist two applications.
   (e) What is a rectifier? Classify single phase controlled rectifiers with their waveforms.

2. (a) Explain single phase inverter operation with neat circuit diagram and waveforms. 7
   (b) Describe in detail Op-amp as Schmitt trigger with necessary waveforms. 7
   (c) Draw and explain speed- torque characteristics of D.C shunt and series motors. Also, state the application of each. 6

3. (a) What are inverting and non-inverting amplifiers. Write their gain equations. Draw the circuit diagram for op-amp as a summer and write its output voltage equation. 7
   (b) With neat circuit diagram and waveforms, explain 180° mode of conduction for a 3 phase bridge inverter circuit. 7
   (c) Analyze torque-speed characteristics of induction motor. State various methods of speed control of induction motors. 6

4. (a) Draw and explain architecture of MSP430 microcontroller. 7
   (b) Explain with block diagram IC555 timer as astable multivibrator. 7
   (c) Compare power BJT, power MOSFET and IGBT. 6

5. (a) Classify the triggering methods of SCR. Explain any one in detail. 7
   (b) Explain multiplexer and demultiplexer in digital circuits. Enlist their applications. 7
   (c) Compare microprocessor and microcontroller. 6

6. (a) Why is MSP430 called as mixed signal processor? Explain different peripherals of MSP430. 7
   (b) Explain any one method for the speed control of D.C motors. 7
   (c) What are flip flops? Why are they needed in digital circuits? Compare the different types of flip flops. 6

Mech/ Civil - SE - Sem IV | Rev - CBSGS | May June 17
Subject - AM IV
15-5-17

Q. P. Code : 538901

[3 Hours] [Total Marks: 80]

N.B. (1) Question No. 1 is compulsory.

(2) Attempt any three of the remaining.

(3) Use of statistical table is allowed.

1. (a) Using Green's theorem evaluate 5

$\int_c \overline{F} \cdot d\overline{r}$ where $\overline{F} = x^2 i - xy j$ and c is the triangle having vertices A(0,2), B(2,0), C(4,2)

(b) Use Cayley – Hamilton theorem to find $2A^4 - 5A^3 - 7A + 6I$ where $A = \begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$ 5

(c) If the mean of the following distribution is 16 find m, n and variance 5

X	8	12	16	20	24
P (X=x)	1/8	m	n	1/4	1/12

(d) The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 Girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than girls. 5

2. (a) Calculate Spearman's coefficient of rank correlation from the data on height and weight of 8 students 6

Height (in inches)	60	62	64	66	68	70	72	74
Weight (in lbs)	92	83	101	110	128	115	137	146

(b) It is known that the probability of an item produced by a certain machine will be defective is 0.05. If the produced items are sent in the market in packets of 20, find the number of packets containing (i) at least 2 (ii) exactly 2 (iii) at most 2 defective items in a consignment of 1000 packets using Poisson distribution. 6

(c) Find the eigen values and eigen vectors of the matrix 8

$$A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$$

[Turn over

3\. (a) Two different processes A and B are used to manufacture light bulbs. Samples were drawn from these two populations and following results were obtained 6

Population	A	B
Sample size	20	17
Sample Standard deviation	60	50

Test the hypothesis that variance of A is greater than variance of B

(b) Using the method of Lagrange's multipliers solve the following N.L.P.P. 6

Optimize $Z = 6x_1^2 + 5x_2^2$

Subject to $x_1 + 5x_2 = 7$ and $x_1, x_2 \geq 0$

(c) Prove that $\overline{F} = (2xy + z^3)\hat{i} + (x^2 + 2yz^3)\hat{j} + (3y^2z^2 + 3xz^2)k$ is irrotational, find the scalar potential for $\overline{F}$ and the work done in moving an object in this field from (1, 2, 0) to (2, 2, 1) 8

4\. (a) In an intelligence test administered to 1000 students the average score was 42 and standard deviation was 24. Find the number of students (i) exceeding the score 50 (ii) between 30 and 54 6

(b) Use Gauss's divergence theorem to evaluate $\iint_S \overline{N}.\overline{F}\,ds$ where $\overline{F} = 2x\hat{i} + xy\hat{j} + z\hat{k}$ over the region bounded by the cylinder $x^2+y^2 = 4$, $z = 0$, $z = 6$ 6

(c) A sample of 400 students of undergraduates and 400 students of post graduate Classes was taken to know their opinion about autonomous colleges. 290 of the undergraduate and 310 of the post graduate students favored the autonomous status. Present these facts in the form of a table and test at 5% level, that the opinion regarding Autonomous status of colleges is independent of the level of classes of students 8

5\. (a) Seven dice are thrown 729 times. How many times do you expect at least four dice to show three or five? 6

(b) Use Stoke's theorem to evaluate $\int_c \overline{F}.dr$ where $\overline{F} = xzi - y^2 j + yzk$ and c is the boundary of x=0, y=0 and $x^2+y^2 = 1$ in the plane z = 0 6

[Turnover

(c) A chemical engineer is investigating the effect of process operating temperature X on product yield Y. The results in the following data 8

X	100	110	120	130	140	150	160	170	180	190
Y	45	51	54	61	66	70	74	78	85	89

Find the equation of regression line which will be enable to predict yield on the basis of Temperature. Find also the correlation coefficient between X and Y

(a) Ten individuals are chosen at random from a population and their heights are found to 6 63, 63, 64, 65, 66, 69, 69, 70, 71, 70 inches. Discuss the suggestion that the mean height of the population is 65 inches.

(b) Show that the matrix A is derogatory and find its minimal polynomial 6

$$A = \begin{bmatrix} 2 & -3 & 3 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$$

(c) Using the Kuhn-Tucker conditions solve the following problem 8

Maximize $z = 10x_2 + 10x_1 - x_1^2 - x_2^2$

Subject to $x_1 + x_2 \leq 8$

$-x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

AUTO / FM II / CBGS / Sem IV May 2017

19/05/17

Q. P. Code: 13609

Instructions: Question no.**1 is compulsory.**

Attempt any **THREE** from question no. 2 to 6.

Use illustrative diagrams where ever required.

Q1 Solve any 4

a Match the following pairs 5

Lemonade	Dilatant
Blood	Bingham Plastic
Mud	Pseudo Plastic
Tooth paste	Newtonian

b Prove that the Stream function and Velocity Potential functions are perpendicular to each other at all points of intersections. 5

c Explain the working of an Orifice meter. 5

d Define Reynold's number and its significance. 5

e Define the following i) Displacement thickness ii) Momentum thickness 5

Q2 **a** A sliding gate 3m wide and 1.5m high situated in a vertical plane has a co efficient of friction between itself and the guide of 0.18. If the gate weighs 19 kN and its upper edge is at a depth of 9m, what vertical force is required to raise it ? Neglect the buoyant force on the gate. 10

b Explain i) Prandtl's mixing length theory 10

and ii) Minor losses in pipes

Q3 **a** A flow field is given by 10

$$\vec{U} = x^2 i + yx^2 j - (2xyz + yz^2)k$$

Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at a point (2,1,3)

b Given the velocity distribution in a laminar boundary layer on a flat plate as 10

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - 2\left(\frac{y}{\delta}\right)^3 + \left(\frac{y}{\delta}\right)^4$$

Where u is the velocity at the distance y from the surface of the flat plate and U be the free stream velocity at the boundary layer thickness δ. Obtain an expression for boundary layer thickness, shear stress, and force on one side of the plate in terms of Reynolds number.

Q4 a Fluid is in laminar motion between two parallel plates separated by distance *h* under the action of motion of one of the plates and also under the presence of pressure gradient in such a way that the net forward discharge across any section is zero. Consider U to be the velocity of the moving plate. 10

i) Find the point where minimum velocity occurs and its magnitude.
ii) Draw a rough sketch of velocity distribution across any section.

b A normal shock wave occurs in a duct in which air is flowing at a Mach number of 1.5. The static pressure and temperature upstream of the shock wave is 1.5 bar and 270°C. Determine pressure, temperature and Mach number downstream of the shock. 10

Q5 a A 120° reducing bend is placed in a horizontal plane. The diameter at the inlet is 100mm and at the exit is 50mm. If the pressure at the inlet is 0.5 kgf/cm² and the discharge is 1200 *lpm*. Calculate the net flow. Use control volume approach. 10

b Three pipes of diameters 300 mm, 200 mm & 400 mm and lengths 450 m, 255 m, & 315 m respectively are connected in series. The difference in water surface levels in two tanks is 18 m. Determine the rate of flow of water if coefficients of friction are 0.0075, 0.0078 & 0.0072 respectively. (Consider minor losses). 10

Q6 a Draw a neat sketch of Venturimeter and derive an expression for discharge through the Venturimeter. Explain the terms C_d, C_v and C_c. 10

b **Solve any 2**

i) Explain Boundary layer Separation 5

ii) Write a note on flow through Convergent-Divergent Nozzle. 5

iii) State and explain the hydrostatic law. 5

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AUTO/ Sem VI / CBSGS/ Tom-2 / 25/5/17

T0324 / T1061 THEORY OF MACHINES I

Q.P.Code: 016047

(3 Hours) Total Marks: 80

N.B. 1) Question No.1 is compulsory.
2) Attempt any three questions out of the remaining five questions.
3) Figures to the right indicate full marks.
4) Assume suitable data wherever required but justify the same.

Q1. Attempt any four (20)

A. State and explain Grashoff's law.

B. Prove that the elliptical trammel can trace an ellipse as well as a circle.

C. Prove that the velocity of sliding is proportional to the distance of the point of contact from the pitch point with respect to gears.

D. Define the terms trace point, pitch point and stroke with respect to cams with the help of neat sketch.

E. What are the different types of Instantaneous centers?

Q2 A. A uniform bar of mass 'm' and length 'L' hangs from a frictionless hinge. It is released from the horizontal position. Find the angular velocity of the center of mass 'G', when it is in vertical position. Solve by work energy principle. (8)

B. A pair of gear, having 40 and 30 teeth, respectively is of 25^0 involute form. The addendum length is 5 mm and module is 2.5 mm. If the smaller wheel is driver and rotates at 1500 rpm, find the velocity of sliding at the point of engagement and at the point of disengagement. (12)

Q3 A. Sketch a Pantograph, explain its working and show that it can be used to reproduce an enlarged scale of a given figure. (8)

B. Two gears having 40 and 50 involute teeth respectively are in mesh. The module of gears is 10 mm and pressure angle is 20^0. The line of contact on each side of the pitch point is two third of maximum possible length. Find addendum on pinion and gear, length of path of contact and contact ratio. (12)

Q4 A. Derive the condition for transmitting the maximum power in a flat belt drive and find the velocity of the belt for the maximum power. (8)

B. A cam with a minimum radius of 50 mm, rotating clockwise at a uniform speed is required to give a knife edge follower the motion as described below; (12)

i) To move outwards through 40 mm during 100^0 rotation of the cam.
ii) To dwell for next 80^0.
iii) To return to its starting position during next 90^0
iv) To dwell for the rest period of revolution.

Draw the profile of the cam when the line of stroke of the follower passes through the center of the cam shaft.

The displacement of the follower is to take place with uniform acceleration and retardation motion. Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 rpm.

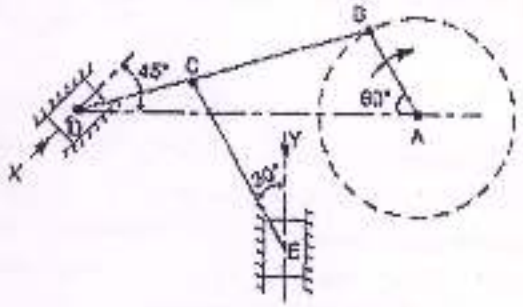
Draw the displacement, velocity and acceleration diagram for one revolution of the cam.

TURN OVER

Q5 A. Derive the equation for the length of a chain with the help of neat sketch. (8)

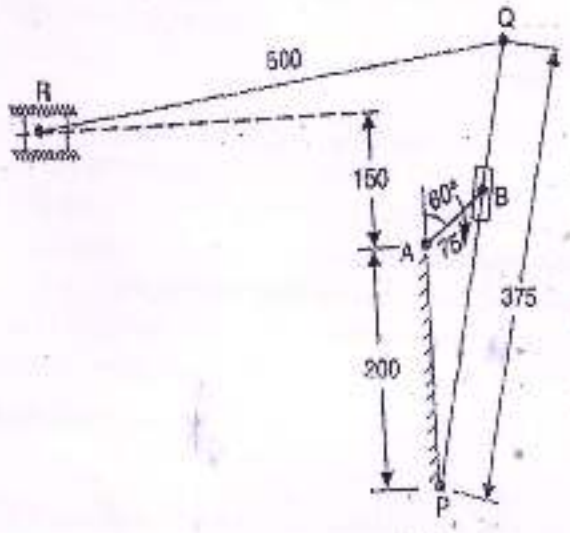
B. The dimensions of a mechanism as shown in the **figure** are as follows: (12)

AB = 0.45 m, BD = 1.5 m, BC = CE = 0.9 m.



The crank AB turns uniformly at 180 rpm in the clockwise direction and the blocks at D and E are working in frictionless guides. Draw the velocity diagram for the mechanism and find the velocities of the sliders D and E in their guides.

Q6 A. The driving crank AB of the quick return mechanism as shown in **figure** revolves at a uniform speed of 200 rpm. Find the velocity and acceleration of the toolbox R, in the position shown, when the crank makes an angle of 60^0 with the vertical line of centres PA. What is the acceleration of sliding of the block at B along the slotted lever PQ? (14)



All dimensions in mm.

B. Classify followers in detail. (6)

AUTO/ IV / CBGS / PP-II / 01-06-17 Q.P.Code:18181

(3 Hours) **[Total Marks : 80]**

N.B. (1) Question no. 1 is **compulsory.**
(2) Attempt any **three** questions out of remaining **five** questions.
(3) **Illustrate** your answer with **necessary** sketch wherever **necessary.**
(4) **Figures** to the **right** indicate full **marks.**

1. Attempt any FOUR of the following : (20)
(a) What are the features of a horizontal CNC machine?
(b) Distinguish between gear hobbing and gear shaping.
(c) Discuss the assumptions made in Merchant's circle diagram.
(d) Explain with neat sketch any one type of lathe tool dynamometer.
(e) Describe radial drilling machine with neat sketch.

2. (a) Discuss various broach terms with neat sketch. Write the formulae for the following elements- (10)
i. Tool pitch
ii. Rise per tooth
iii. Total number of teeth in a broach
iv. Effective length
(b) Write short notes on: Nomenclature of drilling tool. (6)
(c) Write in brief about tool signature. (4)

3. (a) In an orthogonal cutting, the following observations were made. (10)
Rake angle = 10°, Cutting speed = 50 m/min, chip thickness = 0.4mm, uncut chip thickness = 0.148 mm, depth of cut = 2mm, cutting force = 1500N, Thrust force = 1000N. Calculate (i) chip reduction coefficient, (ii) shear angle (iii) shear force (iv) force normal to the shear plane (v) frictional force (vi) normal to frictional force (vii) shear stress (viii) shear strain (ix) coefficient of friction (x) resultant force.
(b) Explain the mechanism of chip formation. (6)
(c) Explain orthogonal rake system in detail. (4)

4. (a) How is gear manufactured? and also explain the limitations of the different processes. (10)
(b) Explain shaping machines with neat diagram. (6)
(c) Write notes on single point cutting tools. (4)

5. (a) State various machining centers. Describe any one in detail. (10)
(b) Explain NC, CNC and DNC machine with block diagram. (6)
(c) Explain automatic tool changer. (4)

Turn Over

6. Write short notes on any **FOUR** :

(a) Geometry of milling cutter.

(b) Oil based cutting fluids.

(c) Taylor's tool life equation.

(d) GM codes in CNC machines.

(e) Types of chips.

AUTO/Sem IV/CBSGS/MT/07/06/17

T0524 / T1063 MATERIALS TECHNOLOGY

Q.P.Code: 013965

(3 Hours) [Total Marks: 80]

N. B. 1) Question No. 1 is compulsory
2) Attempt any Three Questions out of remaining Five Questions
3) Figures to right indicate Full Marks
4) Assume suitable data if necessary

Q. 1. Write note on any four 5 X 4 = 20
a) Effect of Alloying Elements on Phase Transformation
b) Critical Resolved Shear Stress
c) Creep Test
d) What are Composites? Give Classification of Composites.
e) Importance of Iron as Engineering Material

Q. 2 (a) Draw and Explain Isomorphous and Eutectoid Phase diagram. 08
Q. 2 (b) What is deformation? Explain the slip mode of deformation. 06
Q. 2 (c) Define Fatigue. Draw S – N curve and explain its interpretation. 06

Q. 3 (a) Draw Iron and Iron Carbide (Fe – Fe_3C) diagram and explain the phases existing in it. 12
Q. 3 (b) Explain Flame Hardening and Induction Hardening. 08

Q. 4 (a) Draw and Explain construction of Time Temperature Transformation (TTT) diagram of 0.8% C alloy. 10
Q. 4 (b) Derive an expression for Griffith theory for Brittle Fracture. 10

Q. 5 (a) Give classification of Stainless Steel. 05
Q. 5 (b) Differentiate in between Edge Dislocation and Screw Dislocation. 05
Q. 5 (c) What is Case Hardening? Explain Carburising in detail. 10

Q. 6 Write short note on any four 5 X 4 = 20
(a) Types of Cast Iron
(b) Hardenability Test
(c) Austempering
(d) Methods used for Nanomaterials Synthesis
(e) Normalising

Auto / IV / CBGS / IE / 13/06/2017

T0524 / T1023 INDUSTRIAL ELECTRONICS

Q.P. Code:18099

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