



ANJUMAN-I-ISLAM'S  
**AKTC** KALSEKAR TECHNICAL CAMPUS  
 INNOVATIVE TEACHING - EXUBERANT LEARNING

School of Architecture

School of Engineering & Technology

School of Pharmacy

*Knowledge Resource & Relay Centre (KRRC)*

AIKTC/KRRC/SoET/ACKN/QUES/2017-18/

Date: \_\_\_\_\_

School: SoET-CBCS

Branch: MECH. ENGG.

SEM: IV

To,  
 Exam Controller,  
 AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following <sup>✓</sup>Semester/<sup>✓</sup>Unit Test-I/<sup>✓</sup>Unit Test-II (Reg./ATKT) question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- IV	MEC401		✓	
2	Fluid Mechanics	MEC402		✓	
3	Industrial Electronics	MEC403		✓	
4	Production Process II	MEC404		✓	
5	Kinematics of Machinery	MEC405		✓	

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)  
 Librarian, AIKTC

254

11/5/18

Q.P. Code: 38582

Duration - 3 Hours

Total Marks: 80

(1) N.B.: - Question no 1 is compulsory.

(2) Attempt any THREE questions out of remaining FIVE questions.

Q.1) a) If  $\lambda$  is an eigen value of matrix A, then prove that  $\lambda^n$  is an eigen value of  $A^n$  and hence find the eigen values for  $A^2 + 2A + 5I$ , where (5)

$$A = \begin{bmatrix} 2 & 1 & -2 \\ 0 & 2 & 4 \\ 0 & 0 & 3 \end{bmatrix}$$

b) The probability density function of a random variable X is (5)  
 $f(x) = kx^2(1 - x^3), 0 \leq x \leq 1$ . Find k, expectation and variance of x.

c) A machine is set to produce metal plates of thickness 1.5 cm with (5)  
standard deviation 0.2 cm. A sample of 100 plates produced by the machine gave an average thickness of 1.52 cm. Is the machine fulfilling the purpose?

d) Write the dual of the given LPP; (5)  
Minimize  $z = 2x_1 + 3x_2 + 4x_3$   
Subject to:  $2x_1 + 3x_2 + 5x_3 \geq 2, 3x_1 + x_2 + 7x_3 = 3,$   
 $x_1 + 4x_2 + 6x_3 \leq 5,$   
 $x_1, x_3 \geq 0$  and  $x_2$  is unrestricted.

Q.2) a) Check whether the given matrix A is diagonalizable, diagonalize if it (6)

is, where  $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ .

b) Verify Green's theorem for  $\vec{F} = (x^2 - y)i + (2y^2 + x)j$  where C is (6)  
the boundary of region bounded by  $y = x^2, y = 4$ .

c) The heights of six randomly chosen sailors are in inches (8)  
:63,65,68,69,71 and 72. The heights of ten randomly chosen soldiers are: 61,62,65,66,69,70,71,72 and 73.  
Discuss in the light that these data throw on the suggestion that the soldiers on an average taller than sailors.

Q.3) a) Use Big-M method to solve (6)  
Minimize  $z = 10x_1 + 3x_2$   
Subject to:  $x_1 + 2x_2 \geq 3, x_1 + 4x_2 \geq 4$   
 $x_1, x_2 \geq 0$

Q.P. Code: 38582

- b) Using Gauss Divergence Theorem, evaluate  $\iiint_S \vec{F} \cdot \vec{n} dS$ , where S is the surface of the region bounded by cylinder  $x^2 + y^2 = 4, z = 0, z = 6$  and  $\vec{F} = 2xi + xyj + zk$ . (6)
- c) Find the rank, index, signature and class of the following Quadratic Form by reducing it to its canonical form using Congruent transformations  $4x^2 + 3y^2 + 12z^2 - 8xy + 16yz - 20xz$ . (8)
- Q. 4 a) The number of accidents in a year attributed to taxi drivers in a city follow Poisson distribution with mean 3. Out of 1,000 taxi drivers, find approximately the number of drivers, with (i) no accident in a year, (ii) more than 3 accidents in a year. (6)
- b) Verify Cayley Hamilton Theorem and hence find  $A^{-1}$ , if  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$  (6)
- c) In a test given to two groups of students drawn from two normal Populations marks obtained were as follows: (8)  
Group A: 18, 20, 36, 50, 49, 36, 34, 49, 41  
Group B: 29, 28, 26, 35, 30, 44, 46  
Examine the equality of variances.  
(Given:  $F(0.025) = 5.6$  with d. f. 8 & 6 and  $F(0.025) = 4.65$  with d. f. 6 & 8.)
- Q. 5 a) Show that  $A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$  is derogatory and hence find minimal polynomial. (6)
- b) Prove that  $\vec{F} = (2xy^2z^2)i + (x^2z^2 + z \cos yz)j + (2x^2yz + y \cos yz)k$  is irrotational. Find  $\phi$  such that  $\vec{F} = \nabla\phi$ . Hence find the work done in moving an object in this field from  $(0,0,1)$  to  $(1, \pi/4, 2)$ . (6)
- c) Out of a sample 120 persons in a village, 76 were administered a new drug for preventing influenza and out of them 24 persons were attacked by influenza. Out of these were not administered the new drugs, 12 persons were not affected by influenza. Use Chi-square method to find out whether the new drug is effective or not? (8)

Q.P. Code: 38582

- Q. 6 a) Evaluate  $\int_C (x+2y)dx + (x-z)dy + (y-z)dz$  where  $C$  is the boundary of (6)  
the triangle with vertices  $(2,0,0), (0,3,0), (0,0,6)$  oriented in the anti-clockwise direction.
- b) Ten individuals are chosen at random from a population and their heights are found to be (inches): 63, 63, 66, 67, 68, 69, 70, 71 and 71. In the light of the data, discuss the suggestion that the mean height in the population is 66 inches. (6)
- c) Using dual simplex method solve the given LPP (8)
- Minimize  $z = 2x_1 + x_2$   
Subject to:  $3x_1 + x_2 \geq 3, 4x_1 + 3x_2 \geq 6, x_1 + 2x_2 \leq 3$   
 $x_1, x_2 \geq 0$

\*\*\*\*\*

Correction in QP Code : 38582 Subject Name : Applied Mathematics-IV

University of Mumbai  
Tel: confidants@yahoo.com

11/11/2011



University of Mumbai

Correction in Program code : 72134 S.E. (Production Engineering)/SEM-IV/Choice Base I / 10060 Applied Mathematics-IV / 10534 S.E. (S&MT)/Choice Base I / AUTOMOBILE ENGINEERING / 11006 Applied Mathematics-IV / 11534 S.E. (Mechanical Engineering) / SEM-IV/Choice Base I / 10060 Applied Mathematics-IV / 10534 S.E. (Civil Engineering)/SEM-IV/Choice Base I / 10060 Applied Mathematics-IV QP Code : 38582

Read As:

Q. 5(c) out of these were not administered the new drugs

Correction

Out of these who were not administered the new drugs

Correction

Q. 5(b) heights are found in inches 63 64 65 66 67 68 69 70 71 & 74

University of Mumbai  
Tel: confidants@yahoo.com

Doc  
File

156

SE-sem-IV-Choice Based-Mech-FM

17/05/11

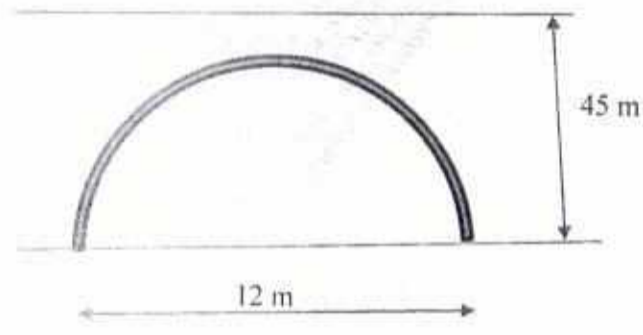
Q.P. Code: 21376

(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 the right indicate full marks.  
(4) Assume any suitable data if necessary and justify the same.

- Q1 Solve any FOUR
- A) Explain briefly the boundary layer formation and define boundary layer thickness. 5
  - B) With neat sketch explain working and construction of a Pitot tube 5
  - C) The following represent the velocity components. Calculate the unknown velocity component so that they satisfy the continuity equation. 5  
$$u = 2x^2 ; v = 2xyz$$
  - D) The absolute viscosity of a liquid having a specific gravity of 0.87 is 0.073 Poise. Find its kinematics viscosity in  $m^2/s$  and in stokes. 5
  - E) Explain Stability of floating bodies. 5
- Q2 A) Derive the differential form of the general mass conservation equation in Cartesian coordinate for a fluid. 10
- B) A semicircular 12 m diameter tunnel is to be built under a 45 m deep, 240 m long lake. Determine the magnitude and direction of total hydrostatic force acting on the roof of the tunnel. 10



Q.P. Code: 21376

Q3 A) A 90° vertical reducing bend has a diameter 300 mm at inlet and 150 mm at exit carries 0.6 m<sup>3</sup>/s oil of specific gravity 0.85 with a pressure of 120 KN/m<sup>2</sup> at inlet to the bend. The volume of bend is 0.15 m<sup>3</sup>. Find the magnitude and direction of the force on the bend. Neglect the frictional losses and assume both inlet and outlet sections to be at same horizontal level. 10

B) Consider a two dimensional viscous incompressible flow of a Newtonian fluid between two parallel plates, separated by a distance 'b'. One of the plates is stationary and the other is moving with a uniform velocity U. There is no pressure gradient in the flow. Obtain the general equation from the general Navier-Stokes equation. 10

Q4 A) Using the laminar boundary layer velocity distribution: 10

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

- i) Check if boundary layer separation occurs.
- ii) Determine Boundary layer thickness (In terms of Re)

B) Derive Euler's equation of motion in Cartesian co-ordinate. 10

Q5 A) Air has a velocity of 1000 km/hr at a pressure of 9.81 KN/m<sup>2</sup> vacuum and a temperature of 47°C. Compute its stagnation properties (Pressure, Temperature and Density). Take atm. pressure 98.1 KN/m<sup>2</sup>, R = 287 J/Kg°K and  $\gamma = 1.4$  10

B) A flow has a velocity potential function as  $\phi = x^3 - 3xy^2$ . Verify whether it represents a valid flow field. If it does then determine the stream function. 10

Q6 A) Two reservoirs are connected by three pipes in series. 10

Pipe	Length	Diameter	f
1	500 m	30 cm	0.02
2	200 m	10 cm	0.025
3	100 m	10 cm	0.03

Calculate the discharge through them if the elevation difference of the levels is in the reservoirs is 10 m considering minor losses.

B) Write short notes (any TWO) 10

- I. Moody's Diagram
- II. Lift force on circulating cylinder in uniform flow.
- III. Compressible flow through the Convergent Divergent Nozzle

156

SE-semr-IV - Choice Based - Mechanical - IE

28/5/18

Q.P.Code: 38720

(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) Draw an inverting and non-inverting amplifier. Write their gain equations.  
(b) Draw the VI characteristics of SCR and define the terms latching current and holding current.  
(c) Implement basic gates using NAND gate.  
(d) What is BLDC motor? List its applications.  
(e) Compare microprocessors and microcontrollers.
- 2.(a) Draw and explain single phase full wave fully controlled rectifier with the help of waveforms for R load. 7  
(b) Illustrate how a DIAC- TRIAC pair can be used for controlling the illumination of a bulb. 7  
(c) Compare AC and DC motors. 6
- 3.(a) Explain Instrumentation amplifier. List its applications. 7  
(b) With neat circuit diagram and waveforms, explain the working principle of single phase bridge inverter circuit. 7  
(c) Select motors for medium power pump and conveyor applications. 6
- 4.(a) List the different applications of a microcontroller. Explain any one in detail. 7  
(b) Explain with block diagram IC555 timer as monostable multivibrator. 7  
(c) Explain GTO. How does it differ from an SCR. 6
- 5.(a) Classify the commutation methods of SCR. Explain any one in detail. 7  
(b) Explain encoder and decoder in digital circuits. Enlist their applications. 7  
(c) Give an overview of a generic microprocessor. 6
- 6.(a) Explain the different peripherals of MSP430 microcontroller. 7  
(b) Explain 180° mode of conduction for a three phase bridge inverter circuit. 7  
(c) With respect to digital circuits, define the following terms: Noise Immunity, Fan Out and Propagation Delay. 6



186

SE-sem-IV- choice Based - Mech - PP-II

29/5/18

Q. P. Code : 50533

(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) Explain types of chips produced during machining process.
  - (b) Explain machinability.
  - (c) Distinguish between Additive Manufacturing (AM) and CNC machining.
  - (d) Compare milling fixture and drilling fixture.
  - (e) Explain scrap strip layout.
2. (a) Define tool life and explain factors affecting tool life (10)  
(b) Write in detail about indexing devices. (6)  
(c) Explain in detail about powder bed fusion. (4)
3. (a) State the classification of AM(Additive Manufacturing) / RP (Rapid Prototyping) systems and explain any one in detail. (10)  
(b) List different types of dynamometers and explain strain gauge type dynamometer. (6)  
(c) Explain end milling cutters in detail. (4)
4. (a) Describe the mechanism of chip formation in detail. (10)  
(b) Explain the steps in designing bending dies. (6)  
(c) Explain the design principles for turning fixtures. (4)
5. (a) Give the classification of non traditional machining processes and explain water jet machining in detail. (10)  
(b) Estimate the blanking force to cut a blank of 20 mm wide and 30 mm long from a 1.2 mm thick metal strip. If the ultimate shearing strength of the material is 450 N/mm<sup>2</sup>, also find the work done if the percentage penetration is 30% of the thickness. (6)  
(c) Differentiate between orthogonal and oblique cutting. (4)
6. Write short note on: 20
- (a) Factors affecting surface finish
  - (b) 3D Systems Stereolithography Apparatus (SLA)
  - (c) Types of coolants
  - (d) Chemical machining
  - (e) Balancing of grinding wheels

\*\*\*

156

4/6/18

(3 hours)

Total Marks: 80

- NB
- 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. What is Degree of freedom(DOF) of plane mechanism? Find DOF of single-slider crank mechanism using Kutzbach criteria.
- B. Explain with neat sketch the Watt's linkage for generating approximate straight line.
- C. What is instantaneous center of rotation? How to find number of instantaneous centers in a mechanism?
- D. State and derive law of Gearing.
- E. What is the effect of centrifugal tension on power transmitted in belt drive?

Q2. A. Two  $20^\circ$  involute spur gear have a module of 10 mm. The addendum is one module. The large gear has 50 teeth and pinion has 13 teeth. Does interference occur? If it occur, to what value the pressure angle be changed to eliminate interference? (10)

B. State and explain law of belting. (5)

C. What is self-locking and self-energised brake? (5)

Q3. A. An open belt drive is required to transmit 10kW of power from a motor running at 600 rpm. Diameter of driving pulley is 250 mm. The speed of driven pulley is 220 rpm. The belt is 12 mm thick and has mass density of  $0.001 \text{ gm/mm}^3$ . Safe stress in the belt is not to exceed  $2.5 \text{ N/mm}^2$ . The two shaft are 1.25 mm apart. The coefficient of friction is 0.25 mm. Determine width of belt. (10)

B. A CAM is to give following motion to knife-edge follows: (10)

- i) To raise the follower through 30 mm with uniform acceleration and deceleration during  $120^\circ$  rotation of the CAM
- ii) Dwell for next  $30^\circ$  CAM rotation
- iii) To lower the follower with Simple Harmonic Motion during next  $90^\circ$  of CAM rotation
- iv) Dwell for rest of CAM rotation

The CAM rotates in counter-clockwise direction with uniform speed of 800 rpm and has minimum radius of 30 mm. Find and draw maximum velocity and maximum acceleration during outward and return stroke.

Q4. A. The annulus A in the gear train shown in fig. 1 rotates at 300 rpm about the axis of the fixed wheel S which has 80 teeth. The three armed spider is driven at 180 rpm. Determine the number of teeth required on wheel P. (10)

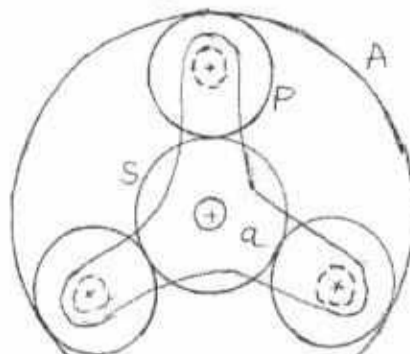
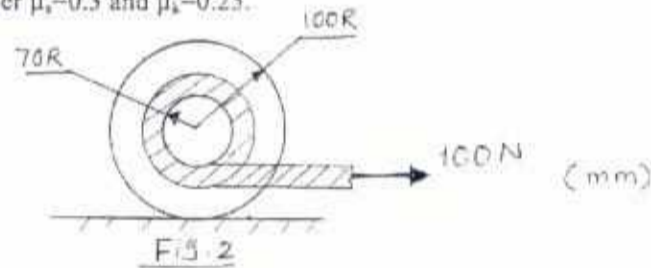


Fig. 1 Gear Train

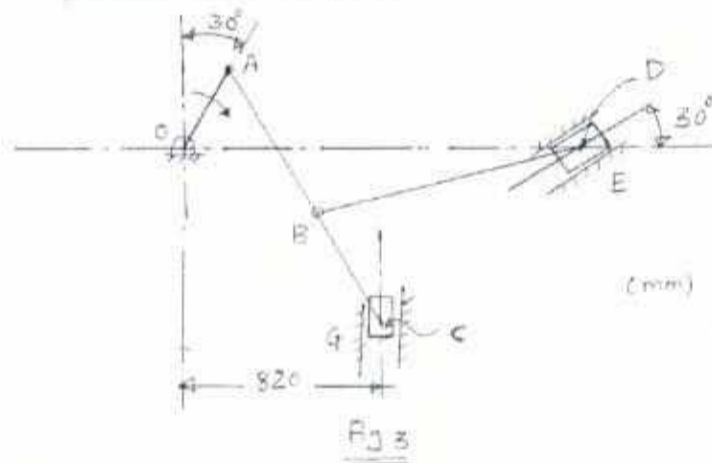
PTO

Q. P. Code : 21791

- B. A wheel of mass 30 kg is pulled horizontally with force of 100 N applied through a cord wrapped around inner drum of wheel as shown in fig 2. The wheel has radius of gyration of 75 mm, determine linear acceleration of mass center and angular acceleration of wheel. Consider  $\mu_s=0.3$  and  $\mu_k=0.25$ . (10)

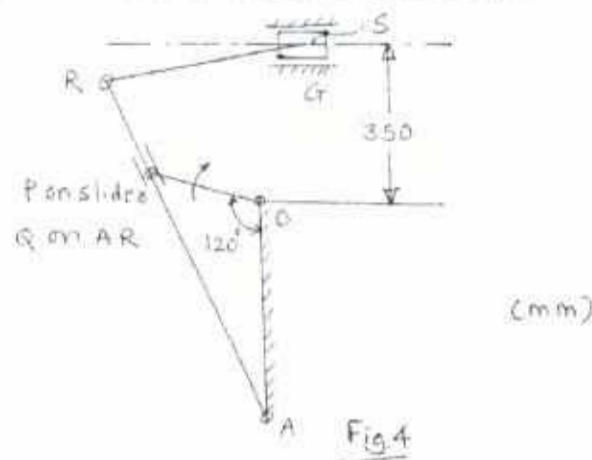


- Q5 A. For the mechanism shown in fig. 3, has following dimensions: (14)  
 $OA=300$  mm,  $AB=600$  mm,  $AC=BD=1.2$  m,  $OD$  is horizontal for given configuration. If  $OA$  rotates at 200 rpm in clockwise direction, find the velocity of slider  $D$  By  
 i) Relative velocity method  
 ii) Instantaneous center method



- B. With neat sketch, explain the fundamental equation of steering gears for correct gearing. (06)

- Q6 A. Fig. 4 shows a link mechanism of a quick-return mechanism of slotted-lever type. The dimensions of links are as follows: (14)  
 $OA=400$  mm,  $OP=200$  mm,  $AR=700$  mm,  $RS=300$  mm.  
 For the configuration shown, determine the acceleration of cutting tool  $S$  and angular acceleration of link  $RS$ . The crank  $OP$  rotates at 210 rpm.



- B. Explain chordal action in chain drive. (06)

==xox==

Find messages, documents, photos or people

Compose

← Back

- Inbox** 36
- Unread
- Starred
- Drafts 30
- Sent
- Archive
- Spam
- Deleted Items
- Less
- Views Hide
- Photos
- Documents
- Travel
- Tutorials
- Folders Hide
- + New folder
- imp
- Link
- msg
- software

Correction in Q.P Code : 21791

Yahoo/Inbox

**University of Mumbai** <support@muapps> 4 Jun at 4:04 PM  
To: controllerkrc@yahoo.com



University of Mumbai

Correction in Program Code : 0534 - S.E. (SEM. IV) (Choice Based) (AUTOMOBILE ENGG.) / T10064 - Kinematics of Machinery and T1804 - S.E (Mechanical Engineering) (SEM-IV)(Choice Base) / T10064 - Kinematics of Machinery Q.P Code : 21791

Read As,

Q3(A)

In fourth line, "The two shaft are 1.25 mm apart." shall read as "The two shaft are 1.25 m apart."

University of Mumbai  
<https://muapps.in>  
support@muapps.in  
022-26534263 / 022-26534266  
Mon-Fri, 10am - 5pm

You have received this email because you are registered with us.  
To unsubscribe, please reply to this mail with subject "Unsubscribe"



**University of Mumbai**  
support@muapps.in  
+91 22 2653 4263

What don't you like abt

- It's not relevant
- It's offensive
- It's distracting
- Something else

Why do I see ads?

What don't you like abt

- It's offensive
- It's not relevant
- It's distracting
- Something else

Why do I see ads?