



Reg. No. : .....

Name : .....

**V Semester B.Tech. Engineering Degree (Regular/Supplementary/  
Improvement Including Part Time) Examination, January 2011  
PT 2K6/2K6/CE/ME/EE/EC/CS/IT/AEI501 : ENGINEERING  
MATHEMATICS – IV**

Time: 3 Hours

Max. Marks: 100

**Instructions :** i) Answer all questions.

ii) Assume suitable data that are not given.

- I. a) Define discrete random variable. The probability distribution of a finite random variable  $X$  is given by the table :

5

X	0	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K	13K

Find :

- i) Value of K
- ii)  $P(X < 4)$
- iii)  $P(3 < X \leq 6)$ .
- b) Derive the variance of uniform distribution. 5
- c) Explain with example : 5
- i) Null hypothesis
- ii) Level of significance.
- d) A die was thrown 9000 times and a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing do the data indicate an unbiased die ? 5

P.T.O.



e) Using the generating function prove that, 5

$$P_n(0) = \begin{cases} (-1)^{n/2} \frac{1.3.5\dots(n-1)}{2.4.6\dots n}, & n \text{ is even} \\ 0 & \text{when } n \text{ is odd} \end{cases}$$

f) Prove that  $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ . 5

g) If  $F(s)$  is the complex Fourier transform of  $f(x)$ , then prove that 5

$$F\{f(ax)\} = \frac{1}{a} F\left(\frac{s}{a}\right), a \neq 0.$$

h) If  $F(s)$  is the complex Fourier transform of  $f(x)$ , then prove that 5

$$F\{f(x) \cos ax\} = \frac{1}{2} \{F(s+a) + F(s-a)\}.$$

II. a) Derive mean and variance of exponential distribution. 7

b) In 800 families with five children each, how many families would be expected to have 8

i) 3 boys and 2 girls

ii) 2 boys and 3 girls

iii) Atmost 2 girls by assuming probabilities of births of boys and girls to be equal ?

OR

c) The length of a telephone conversation has an exponential distribution with a mean of 3 min. Find the probability that a call : 7

i) Ends in less than 3 min.

ii) Takes between 3 and 5 min.

iii) More than 3 min.

d) Derive mean and variance of binomial distribution. 8



- III. a) It is guaranteed that a 4-litre can of a wall paint covers 57 square meters on the average with a standard deviation of 3.5 square meters. Find the probability that the total area covered by a sample of 40 of these 4-litre cans will be between 2200 and 2300 square meters. 7
- b) A set of 5 similar coins is tossed 320 times and the result is : 8

**No. of heads :** 0    1    2    3    4    5

**Frequency :**    6    27    72    112    71    32

Test the hypothesis that the data follow a binomial distribution for

$$v = 5, \chi_{0.05}^2 = 11.07.$$

OR

- c) If the mean of an infinite population is 575 with standard deviation of 8.3, how large a sample must be used in order that there be one chance in 100 that the mean of the sample is less than 572 ? 7
- d) A die is thrown 270 times and the results of these throws are given below : 8

**No. appeared on the die:** 1    2    3    4    5    6

**Frequency :**    40    32    29    59    57    59

Test whether the die is biased or not.

- IV. a) Show that  $P_n(x)$  is the coefficient of  $t^n$  in the expansion of

$$(1 - 2xt + t^2)^{-1/2}. \quad \text{8}$$

- b) Prove that  $J_{5/2}(x) = \sqrt{\frac{2}{\pi x}} \left\{ \frac{3-x^2}{x^2} \sin x - \frac{3}{x} \cos x \right\}$ . 7

OR



c) Show that  $J_n(x) = \frac{1}{\pi} \int_0^\pi \cos(n\theta - x \sin \theta) d\theta$ ,  $n$  being an integer. 8

d) Express  $x^3 + 2x^2 - 4x + 5$  in terms of Legendre polynomial. 7

V. a) Find the Fourier transform of  $f(x) = \begin{cases} 1 - x^2, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$

hence evaluate  $\int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos \frac{x}{2} dx$ . 8

b) Find the nature of the quadratic form  $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ . 7

OR

c) Reduce  $3x^2 + 3z^2 + 4xy + 8xz + 8yz$  into canonical form. 8

d) Find the Fourier sine transform of  $\frac{e^{-ax}}{x}$ . 7



**M 18599**

Reg. No. : .....

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**Fifth Semester B.Tech. Engineering Degree (Regular/Supplementary/  
Improvement including Part Time) Examination, January 2011  
PT2K6/2K6/CE/ME502 : ENVIRONMENTAL ENGINEERING AND  
DISASTER MANAGEMENT**

Time: 3 Hours

Max. Marks: 100

*Instruction: Answer all questions.*

1. a) What is meant by natural resources ? Enumerate the various natural resources.  
b) Discuss the importance of forest. What are its economical aspects ?  
c) Distinguish among genetic diversity, species diversity and ecosystem diversity.  
d) Discuss the functions of an ecosystem.  
e) Define air pollution. Write its effect on human health and buildings.  
f) Briefly explain concept of disaster management.  
g) Define sustainable development and discuss its concepts.  
h) What is ozone hole ? How does it form ? Mention its effects. (8×5=40)
2. a) Discuss the importance of environmental studies.  
b) Explain the scope and importance of environmental studies. What is meant by ecosystem and biodiversity ? (7+8=15)  
OR  
c) Discuss as to how awareness for safe environment can be inculcated in individuals and public.  
d) How do the dams influence the quality of life, human settlements and agricultural land ? (7+8=15)
3. a) Describe the uses and importance of biodiversity.  
b) Describe the structure, salient features and functions of a forest ecosystem. (7+8=15)  
OR  
c) Explain 'in situ and ex situ' approaches of conservation of biodiversity. Compare their advantages and disadvantages and limitation. 15

**P.T.O.**



4. a) What are solid wastes and what their different types ? Discuss their effect.  
b) What is disaster management ? Write details about management. (7+8=15)

OR

- c) Write brief note on man made disasters.  
d) What are the main features of the Environmental Protection Act ? (7+8=15)
5. a) Discuss the causes and effects of global warming.

- b) What is meant by 'value and value education' ? Discuss their concept with the help of suitable illustrations. (7+8=15)

OR

- c) Briefly explain the following :
- i) Population explosion
  - ii) Nuclear accidents
  - iii) Acid rain.

(3×5=15)

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V Semester B.Tech. Engg. Degree (Regular/Supplementary/Improvement  
including Part Time) Examination, January 2011  
PT2K6/2K6ME 503 : MECHANICS OF MACHINERY

Time: 3 Hours

Max. Marks: 100

*Instructions :* i) Answer all questions.

ii) Missing data if any may be suitably assumed.

1. a) What are the different types of kinematic pairs ? Explain in detail.
- b) Explain the terms inflection point and inflection circle.
- c) Write a note on principle of virtual work.
- d) Explain complex number method of force analysis.
- e) Differentiate involute and cycloidal gears.
- f) Sketch and explain about 'Reverted gear train'.
- g) Explain the three stages of kinematic synthesis.
- h) Write a note on overlay method of kinematic synthesis. (5×8=40)

2. a) Sketch and explain the inversions of (any three) single slider crank chain. 15

OR

- b) The slider crank mechanism shown in fig. 1 has crank  $OC = 0.3$  m and connecting rod  $CP = 1.5$  m. The crank rotates at constant speed of 450 rpm clockwise. For the position shown in which  $OC$  is turned  $45^\circ$  from  $OP$  clockwise. Find velocity of piston  $P$ , angular velocity of  $CP$ , acceleration of  $P$  and angular acceleration of  $CP$ . 15

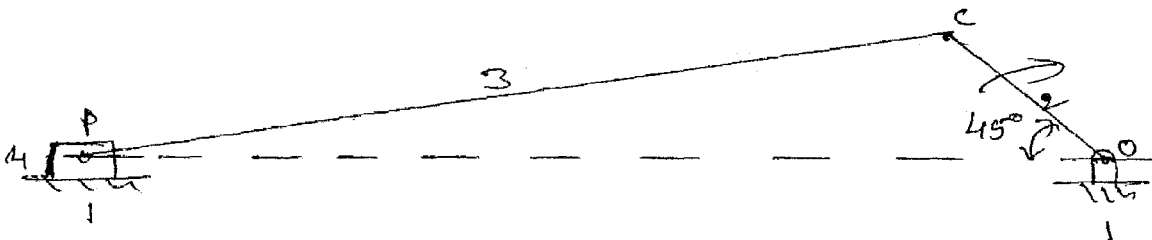


Fig. 1, Q. No. 2b

P.T.O.



3. a) For the four bar mechanism shown in fig. 2, calculate the required value of  $T_2$  and various forces on the links for the equilibrium of the system. 15

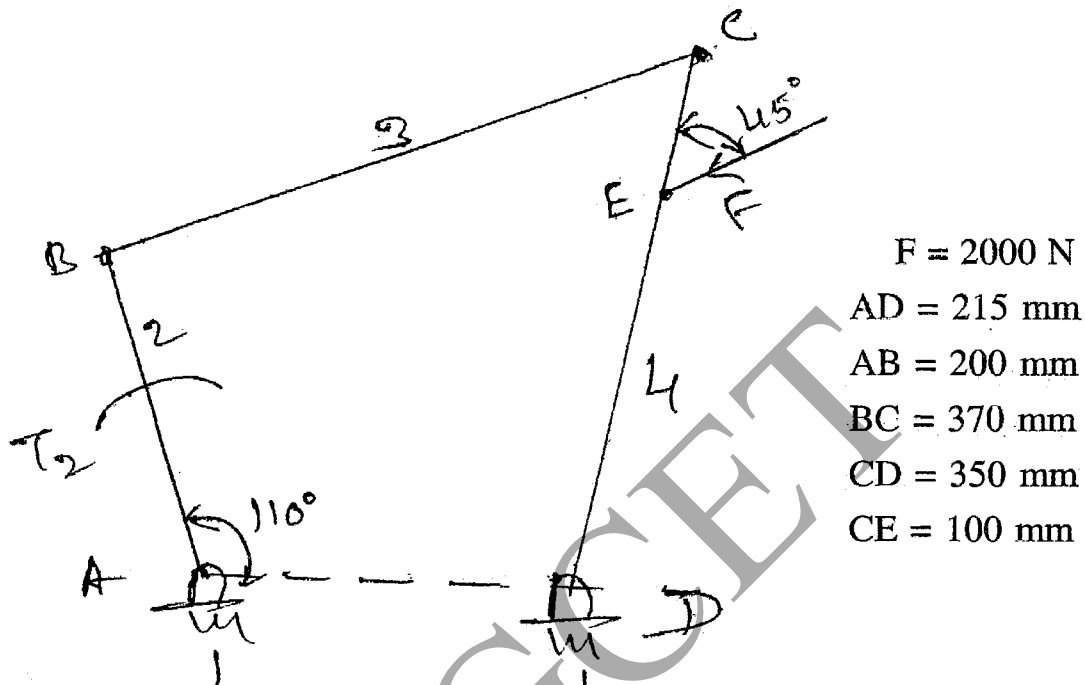


Fig. 2, Q. No. 3a

OR

or write a note on :

- i) Principle of superposition
- ii) Matrix method of force analysis. 15

4. a) What is meant by interference ? Derive the expression for minimum number of teeth on pinion to avoid interference. 15

OR



- b) Fig. 3 shows an epicyclic gear train where the arm A is the driver and annular gear D is the follower. The wheel D has 112 teeth and B has 48 teeth. B runs freely on P and D is separately driven. The arm A runs at 100 rpm and the wheel D at 50 rpm in same direction, find the torque on B if A received 7.5 kW.

15

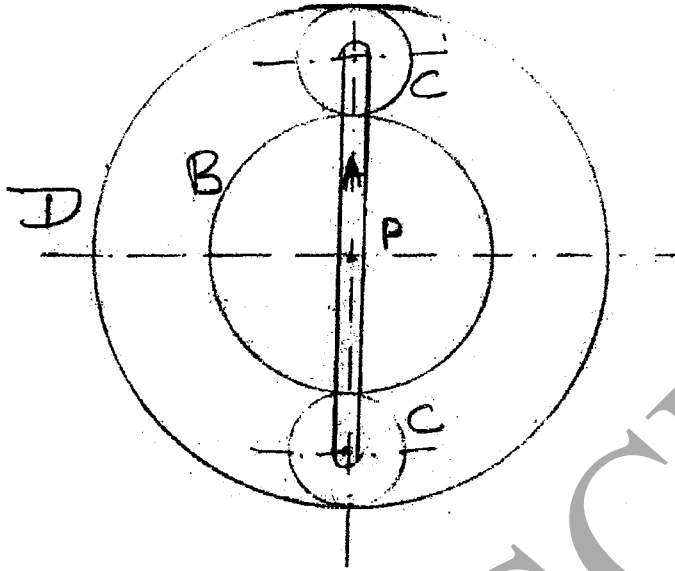


Fig. 3, Q. No. 4b

5. a) With a suitable sketch explain the three position synthesis of four bar mechanism. 15

OR

- b) Write a note on :
- i) Complex number modelling
  - ii) Loop closure equation technique.

15

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M 18605

Reg. No. : .....

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**V Semester B.Tech. Engineering Degree (Regular/Supplementary/  
Improvement including Part Time) Examination, January 2011  
PT2K6/2K6 ME 504 : THERMAL ENGINEERING**

Time: 3 Hours

Max. Marks : 100

**Instructions :** Answer all questions.

*Use of thermodynamics data hand book permitted.*

1. a) What are the advantages of 4-stroke engines over the 2-stroke engines ? Why is the latter preferred for 2-wheelers ?
  - b) Explain the effect of variable specific heat and dissociation on Otto engine efficiency.
  - c) With a diagram show how pressure lubrication is done for piston rings. Explain the purpose of oil scraper ring.
  - d) Explain any one system of turbocharging of a 6 cylinder diesel engine. Enumerate the advantages and disadvantages of turbocharging over natural aspiration.
  - e) Differentiate between detonation and pre-ignition in the SI engine. What are the causes for the latter ?
  - f) Define Cetane No. and describe how it is measured.
  - g) What are the advantages of reheating and regeneration in gas turbines ?
  - h) Sketch and explain an annular combustion chamber for a gas turbine. (8×5=40)
- 
2. a) Derive an expression for the thermal efficiency of an Otto cycle in terms of compression ratio and sp. heat ratio. Also show that for the same compression ratio, constant pressure combustion cycle is less efficient than constant volume cycle. 15

OR

- b) Explain Morse test for a multicylinder engine. 5

P.T.O.



c) A 4 stroke, 4 cylinder engine gave 18.6 KW power at 1200 rpm. When one cylinder was cut off, the average torque was measured to be 105 Nm. The bsfc of the engine is 0.34 kg/kWh Calculate :

- i) Indicated thermal efficiency
- ii) Mechanical efficiency.

Assume CV (fuel) = 42000 kJ/kg.

10

3. a) What are the major pollutants emitted from SI engine exhaust ? Briefly explain methods available to control them.

15

OR

b) Compare the Hotchkiss and Torque tube drives in automobiles. Neatly explain the two diagrams and mention the duties of the leaf springs in the Hotchkiss drive.

15

4. a) With a p- $\theta$  diagram explain the 3 stages of combustion in a SI engine. Discuss the physico-chemical factors which affect the second stage.

15

OR

b) Explain "Delay Period". How is it related to diesel knock ?

Explain how temperature factors and chemical factors affect the diesel knock.

15

5. a) With schematic diagrams explain salient differences between open cycle and closed cycle gas turbine power plants.

What are the relative merits of closed cycle plant over the open cycle plant ?

Show the T-s diagram in the two cases.

10

b) Write a brief note on the nozzle design.

5

OR

c) A gas turbine works with an air inlet temperature to compressor as 15°C and pressure = 1 atmos.

Pressure ratio is 5 and maximum permissible temperature is 580°C. Calculate the ideal efficiency.

If the compressor and turbine isentropic efficiencies are 80% and 85.7% respectively calculate the % reduction in overall efficiency.

Assume,  $C_p$  for air = 1.005 kJ/kgk

$C_p$  for comb. gases = 1.093 kJ/ kgk

$R = 0.287$  kJ/kgk for both air and comb. gases.

15

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**V Semester B. Tech. Engineering Degree (Regular/Supplementary/  
Improvement Including Part Time) Examination, January 2011  
PT2K6/2K6 ME 505 : CAD/CAM/CAE**

Time: 3 Hours

Max. Marks: 100

*Instruction : Answer all the questions.*

UNIT -- I

Answer **all** the questions.

- |  |   |
|--|---|
| I. a) Write a note on central processing unit.   | 5 |
| b) Explain the two types of configuration of an automated flow line.   | 5 |
| c) Differentiate between :   |   |
| i) Fixed zero and floating zero  |   |
| ii) Absolute positioning and incremental positioning.  | 5 |
| d) Explain different geometry statements of APT language and give the general rules that must be followed during implementing. | 5 |
| e) What is work volume of a robot ? Give the work volume of different configuration robots.                                    | 5 |
| f) Explain how a robot can be used for the spot welding process.   | 5 |
| g) List and explain the benefits of CAPP.  | 5 |
| h) What is FMS ? Explain three basic components of FMS.  | 5 |

P.T.O.



## UNIT – II

- II. a) Explain Wire-Frame Models and give its limitations. 5
- b) List different output devices and explain them. 10

OR

- III. a) With a flow diagram show the areas of application of computers to the design process. 4
- b) Explain different types of automation. 6
- c) List different types of in line transfer mechanisms and explain any one. 5

## UNIT – III

- IV. a) Explain three types of NC motion control systems. 7
- b) List different types of NC words and also list different G-codes and M-codes of NC system. 8

OR

- V. a) Explain the advantages of CNC systems. 6
- b) Explain different post processor statement and auxiliary statements of APT language. 6
- c) Write a note on MACRO statement in APT language. 3

## UNIT – IV

- VI. a) Explain different robot programming methods. 8
- b) What are end effectors ? Write a note on :
- i) Grippers
- ii) Tool as end effectors. 7

OR



- VII. a) What are the industrial situation which tend to make the installation of a robot economical and practical ? 4
- b) Give the reason why robot is necessary for spray coading and explain its advantages. 6
- c) Explain the use of robots in assembly operations. 5

UNIT – V

- VIII. a) With a neat block diagram explain basic structure of the Optz. system. 8
  - b) With a block diagram explain retrieval type process planning system. 7
- OR
- IX. a) Explain two types of computerized machinability data system. 8
  - b) What are the functions of material handling and storage system in FMS ? 5
  - c) List the benefits of FMS. 2

SNGOCEIT



M 18607

Reg. No. : .....

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**Fifth Semester B.Tech. Engineering Degree(Regular/Supplementary/  
Improvement Including Part Time)Examination, January 2011  
PT 2K6/2K6 ME 506 : MACHINE TOOLS**

Time: 3 Hours

Max. Marks: 100

*Instructions :1) Answer all questions.  
2) Missing data can be suitably assumed.*

- I. a) 12 mm diameter holes are to be drilled in work pieces made of free machining steel to a depth of 50 mm with HSS. drills. Determine the time of drilling 100 pieces, if the job setup time is 30 sec., drill setup time is 10 sec. and drill is required to be withdrawn after drilling 25 mm for removal of chips, which takes 5 sec. 5
- b) A surface plate of dimensions 1m × 1.2 m is to be machined on a planer. The average cutting speed is set at 24 m/min. The ratio of forward to return speed is 0.75. Determine the time of machining if feed/stroke is 0.5 mm and time for reversing work table is 1.2 sec. Also determine metal removal rate if depth of cut is 4 mm. 5
- c) Write a note on IS designation of grinding wheel. 5
- d) Write a short note on cutting fluids. 5
- e) Briefly explain flank and crater wear. 5
- f) Write a short note on jigs and fixtures. 5
- g) What causes spring back in bending die ? 5
- h) Why would it be good to have double acting press for deep drawing cup. 5
- II. 1) a) Distinguish between ray diagram and speed diagram. 6
- b) Explain stepped diagram and stepless diagram. 5
- c) Briefly explain any four rules of layout of gear box having sliding clusters. 4

OR

- 2) 6 speeds ranging from 25 to 800 rpm in GP. Motor speed is 1500 rpm. Draw structural diagram, speed diagram, layout, flow diagram. 15

P.T.O.

III. 1) Explain the following types of experimental determination of tool temperatures :

- a) Tool workpiece thermocouple
- b) Temperature distribution on Rake face by embedded thermocouple
- c) Infrared photographic technique. 15

OR

- 2) a) With neat sketch explain cutting tool geometry. 8
- b) Determine the temperature rise at shear plane from the following experimental data in orthogonal cutting of mild steel of density  $7.87 \text{ gm/cm}^3$  and specific heat of  $0.44 \text{ J/gm}$  taking that  $\lambda = 1$ . Force component in the direction of cutting velocity  $F_n = 1600 \text{ N}$ . Force component normal to machine surface  $F_v = 500 \text{ N}$ , Depth of cut =  $0.3 \text{ mm}$ , Width of cut =  $5 \text{ mm}$ , Chip thickness ratio =  $0.42$ , Tool rake angle  $10^\circ$ , Cutting velocity =  $35 \text{ m/min}$ . 7

IV. 1) a) Discuss tool failure criteria. 5

- b) What is machinability ? Describe the more important machinability criteria. 10

OR

- 2) a) Briefly explain any 5 design principles common to jigs and fixtures. 5
- b) Briefly explain the properties of the work material that tend to increase the life of tool. 5
- c) Mild steel bars of  $50 \text{ mm}$  diameter are to be turned over a length of  $160 \text{ mm}$  with a depth of cut of  $1.5 \text{ mm}$ , feed of  $0.2 \text{ mm/rev}$  at  $230 \text{ rpm}$  by HSS tools. If the tool life equation is given by  $VT^{0.2} f^{0.3} d^{0.12} = 50$ , determine how many components may be turned before regrinding the tool. 5

V. 1) a) With a neat sketch explain Toggle press. 5

- b) Illustrate the use of combination die with example. 10

OR

- 2) a) With neat sketch explain progressive die for a component. 10
- b) Explain the difference between double crank and double action press. 5

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