

Code : 1G541

R11

II B.Tech. II Semester Supplementary Examinations December, 2014

**Kinematics of Machinery**  
( Mechanical Engineering )

Time: 3 hours

Max Marks: 70

Answer any FIVE of the following

All questions carry equal marks (14 Marks each)

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- Explain different types of Kinematic pairs with the help of neat sketches.
  - Sketch and explain Crank and slotted lever mechanism.
- Name the Different mechanisms which are used for mathematically correct straight line motion. Sketch and explain the Hart's straight-line motion mechanism.
- The crank and connecting rod of a theoretical steam engine are 0.5 m and 2 m long respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned  $45^\circ$  from the inner dead center position, determine: 1. velocity of piston, 2. angular velocity of connecting rod, 3. velocity of point E on the connecting rod 1.5 m from the gudgeon pin, 4. velocities of rubbing at the pins of the crank shaft, crank and crosshead when the diameters of their pins are 50 mm, 60 mm and 30mm respectively, 5. position and linear velocity of any point G on the connecting rod which has the least velocity relative to crank shaft.
- In a pin jointed four bar mechanism, as shown in Fig. 1,  $AB = 300$  mm,  $BC = CD = 360$  mm, and  $AD = 600$  mm. The angle  $BAD = 60^\circ$ . The crank AB rotates uniformly at 100 r.p.m. locate all the instantaneous centers and find the angular velocity of the link BC.

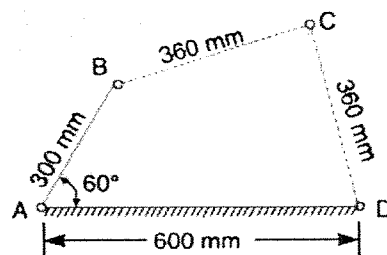


Figure 1

5. A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below :
- To raise the valve through 50 mm during  $120^\circ$  rotation of the cam;
  - To keep the valve fully raised through next  $30^\circ$ ;
  - To lower the valve during next  $60^\circ$ ; and
  - To keep the valve closed during rest of the revolution i.e.  $150^\circ$ ;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when

- The line of stroke of the valve rod passes through the axis of the cam shaft, and
- The line of the stroke is offset 15 mm from the axis of the cam shaft. The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m. Draw the displacement, the velocity and the acceleration diagrams for one complete revolution of the cam.

6. a) State and prove the **law of gearing**
- b) Two involute gears of  $20^\circ$  pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find :
- The angle turned through by pinion when one pair of teeth is in mesh; and
  - The maximum velocity of sliding.
7. A shaft which rotates at a constant speed of 160 r.p.m. is connected by belting to a parallel shaft 720 mm apart, which has to run at 60, 80 and 100 r.p.m. The smallest pulley on the driving shaft is 40 mm in radius. Determine the remaining radii of the two stepped pulleys for **1.** a crossed belt, and **2.** an open belt. Neglect belt thickness and slip.
8. Fig. 2 shows diagrammatically a compound epicyclic gear train. Wheels A, D and E are free to rotate independently on spindle O, while B and C are compound and rotate together on spindle P, on the end of arm OP. All the teeth on different wheels have the same module. A has 12 teeth, B has 30 teeth and C has 14 teeth cut externally. Find the number of teeth on wheels D and E which are cut internally. If the wheel A is driven clockwise at 1 r.p.s. while D is driven counter clockwise at 5 r.p.s., determine the magnitude and direction of the angular velocities of arm OP and wheel E.

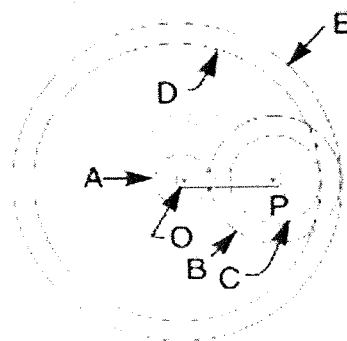


Figure 2

## II B.Tech. II Semester Supplementary Examinations December, 2014

**Thermal Engineering -I**  
( Mechanical Engineering)

Time: 3 hours

Max Marks: 70

*Answer any FIVE of the following  
All questions carry equal marks (14 Marks each)*

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1. a) Why the actual cycle efficiency is much lower than the air standard cycle efficiency? List major losses in an actual engine. 7M
- b) Briefly explain the following: (i) Rubbing frictional losses (ii) Pumping losses (iii) Time loss factor 7M
2. a) What do you mean by carburetion? Describe with a neat sketch a simple carburetor? 8M
- b) Discuss the functions of Lubrication? Describe mist lubrication system used for a two stroke engine? 6M
3. a) What are the ignition limits for different hydrocarbons? Why the flame front progresses relatively slow at the beginning and near the conclusion of combustion and faster during the intermediate portion? Explain. 6M
- b) Explain the phenomena of knock in SI engines with a neat sketch? 8M
4. a) Explain the process of combustion in CI engines and explain the various stages of combustion 7M
- b) Explain the divided combustion chambers used in CI engines? 7M
5. a) What is Willan's line method? To which type of engine it is applicable? What is the accuracy of this method? 4M
- b) The following observations were taken during the testing of single cylinder four stroke oil engine. Brake wheel diameter = 65 cm ; rope diameter = 3 cm; speed = 450 rpm; load on pan = 270 N; spring balance reading = 40 N; area and length of indicator diagram = 4.2 cm<sup>2</sup> & 6.5 cm respectively, spring stiffness = 12 bar/cm; bore = 11 cm; stroke = 16 cm; bsfc = 0.3129 kg/kWh; C.V of fuel = 41868 kJ/kg. Estimate the bP, iP,  $\eta_m$ ,  $\eta_{ith}$ ,  $\eta_{bth}$ . 10M
6. a) Derive an expression for volumetric efficiency of an air compressor? Discuss the factors affecting the volumetric efficiency? 8M
- b) A single stage single acting compressor delivers 15 m<sup>3</sup>/min of free air from 1 bar to 8 bar. The speed is 300 rpm. Clearance is 1/16 of swept volume. Take  $n = 1.3$  and  $L/D = 1.5$ . Find diameter and stroke of the compressor. 6M
7. a) How are rotary compressors classified? Differentiate between reciprocating and rotary compressors? 6M
- b) A centrifugal compressor with 70% isentropic efficiency delivers 20 kg of air per minute at a pressure of 3 bar. If the compressor receives air at 20 °C and at pressure of 1 bar, find the actual temperature of the air at exit. Also find the power required to run the compressor, if its mechanical efficiency is 95 %. 8M
8. a) Explain with a neat sketch the construction and working of an axial flow compressor. 4M
- b) At a particular stage of an axial flow compressor the required temperature rise is 20K. The blade velocity at the mean radius is 200 m/s and the flow velocity is 150m/s. Assuming that the degree of reaction to be 50% at the mean radius and the work done factor is 0.9, calculate the required blade angles at the mean radius. 10M

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Code : 1GC43

R11

II B.Tech. II Semester Supplementary Examinations Dec. 2014

**Environmental Science**  
(Common to CIVIL, ME & CSE)

Time: 3 hours

Max Marks: 70

*Answer any FIVE of the following  
All questions carry equal marks (14 Marks each)*

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1. a) Define Environment? What are the various components of environment? 7M  
b) What is the need for studying environmental issues? 7M
2. a) What are the major causes of Deforestation? Briefly explain the effects of deforestation on environment? 7M  
b) Write an account of the growing energy needs with special reference to India. 7M
3. a) Discuss the ill effects of the use of chemical fertilizers and pesticides in agriculture. 7M  
b) Discuss the impact of over exploitation of minerals on environment. 7M
4. a) What are the main sources of marine pollution? Discuss their effects and suggest methods of control. 7M  
b) Write a note on urban solid waste management practices. 7M
5. a) Write short note on grass land and aquatic eco system? 7M  
b) Write notes on ecological pyramids. 7M
6. a) What are the various threats leading to loss of biodiversity? 7M  
b) Discuss the various strategies of in-situ conservation of biodiversity. 7M
7. a) Discuss the methods and advantages of rain water harvesting. 7M  
b) Explain how global warming is affecting our planet. 7M
8. What do you mean by population explosion? What are its effects on environment and other human aspects? 14

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**Fluid Mechanics and Hydraulic Machines**  
( Mechanical Engineering )

Time: 3 hours

Max Marks: 70

Answer any FIVE of the following  
All questions carry equal marks (14 Marks each)

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- 1 a) Explain:
- i. How certain insects are able to walk on the surface of water? 5M
  - ii. Why petrol evaporates more readily than water at ordinary temperature 5M
- b) Find the torque required to rotate a shaft of diameter 60mm at 1200 rpm concentrically with a sleeve of 60.18mm in diameter and 12m long filled with oil. Kinematic viscosity of oil is  $0.82 \times 10^{-4} \text{ m}^2/\text{s}$ . Specific gravity of oil is 0.75. 9M
2. a) A flow field is represented by a velocity potential function as given below:  
 $A = c(2x^2 - 3y^2)$  Verify whether it is a valid function or not? If valid, then find out the corresponding stream function. 5M
- b) A pipe 250m long has a slope of 1 in 100 and tapers from 1.5m diameter at the higher end to 0.7m at the lower end. The quantity of water owing is 700litres/second. If the pressure at the higher end is 60KPa, find the pressure at the lower end. 9M
3. a) Derive Darcy - Weisbach equation 5M
- b) Petrol of specific gravity 0.8 is owing through a pipe inclined at  $30^\circ$  to the horizontal in upward direction. A venturimeter is fitted in this 25 cm diameter pipe; the ratio of areas of main and throat is 4 and the throat is at a distance of 1.2 m from inlet along its length. The U- tube differential manometer connected to the inlet and throat section registers a steady reading of 5 cm of mercury; the tubes above the mercury being full of water. Find the discharge and pressure difference in kPa between the throat and entrance section. The meter has a discharge coefficient of 0.95 and relative density of mercury is 13.6. 9M
4. a) Derive an expression for the hydraulic efficiency when a liquid jet strikes a single moving curved vane. 5M
- b) A jet of water having a velocity of 35 m/s impinge on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of  $30^\circ$  to the direction of motion of the vanes when entering and leaves at an angle of  $120^\circ$ . Draw the velocity triangle and find:
- i) The angles of vane tips so that water enters and leaves without shock.
  - ii) The work done/unit weight of water entering the vanes.
  - iii) The efficiency 9M



5. a) Enumerate principal components of hydro electric scheme along with their locations and purposes. 5M
- b) From the investigation of hydro site, the following data is available. Available Head = 45m, total catchment area  $60 \text{ km}^2$ , rainfall/annum = 1400 mm, % of rainfall utilised = 68%, turbine efficiency = 82%, generator efficiency = 90%, penstock efficiency = 74%, load factor = 55%. Calculate the suitable capacity of a turbine.. 9M
6. a) Explain the classification of turbines. 5M
- b) A Kaplan turbine develops 45 MW under a head of 22 m. The overall  $\eta$  is 90% and the ratio of outlet to hub diameter is 2.85. Calculate the speed, specific speed and diameter of runner. 9M
7. a) What is the significance of unit power, unit speed and unit discharge? Explain 5M
- b) A turbine is to operate under a head of 30 m and a speed of 300 rpm. The discharge is  $10 \text{ m}^3/\text{s}$ . If the efficiency of the turbine is 90% determine:  
 i) Specific speed of the turbine    ii) Power generated    iii) Type of turbine. 9M
8. a) Explain the working of a reciprocating pump with a neat sketch. 5M
- b) A centrifugal pump has diameter of 50 cm and 25 cm. The speed is 1200 rpm. The impeller vanes are set back at an angle of  $30^\circ$  to the outer rim. The width at outlet is 1.8 cm. Manometric efficiency is 72%. The constant velocity of flow through the impeller is 2 m/s. Determine the vane angle at inlet, work done by the impeller per second per unit weight of water. 9M

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**Manufacturing Technology**  
(ME)

Time: 3 hours

Max Marks: 70

*Answer any FIVE of the following*  
*All questions carry equal marks (14 Marks each)*

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- |       |  |    |
|-------|--|----|
| 1. a) | Enumerate different types of patterns and their applications                                 | 7M |
| b)    | What is gating ratio? Explain different types of gates in detail                             | 7M |
| 2. a) | Describe types of risers and the main requisites for an effective riser.                     | 7M |
| b)    | Explain the Investment casting process and its advantages, applications                      | 7M |
| 3. a) | Describe the following welding process principle and applications                            |    |
|       | (i) Thermit welding (ii) Resistance welding  | 7M |
| b)    | Explain oxy-acetylene gas cutting process and mention its merits and applications of process | 7M |
| 4. a) | Describe the following welding process   |    |
|       | (i) Explosive Welding (ii) Laser Welding (iii) Brazing                                       | 7M |
| b)    | Describe the destructive and nondestructive testing of welds                                 | 7M |
| 5. a) | Explain the hot working of metals and mention its advantages, limitations and applications.  | 7M |
| b)    | Describe the various types of rolling and applications                                       | 7M |
| 6. a) | What is tube spinning? Explain the process of making of hollow shaft                         | 7M |
| b)    | Describe the following metal working processes   |    |
|       | (i) Wire drawing (ii) Stamping (iii) Coining   | 7M |
| 7. a) | Describe the forward and backward extrusion processes with neat sketches                     | 7M |
| b)    | Describe the following extrusion   |    |
|       | (i) Hydrostatic extrusion (ii) Impact extrusion  | 7M |
| 8. a) | Explain the principle, merits and applications of Water jet machining process                | 7M |
| b)    | Explain the principle, merits and applications of Electro chemical machining Process         | 7M |

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Code : 1GC42

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)

II B.Tech. II Semester Supplementary Examinations December, 2014

**Probability & Statistics**  
(Common to Civil, ME & IT)

Time: 3 hours

Max Marks: 70

*Answer any FIVE of the following*  
*All questions carry equal marks (14 Marks each)*

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1. a) Calculate the mean and standard deviation for the following.

$x$	6	7	8	9	10	11	12
$f$	3	6	9	13	8	5	4

- b) Obtain the rank correlation coefficient for the following data

$X$ :	68	64	75	50	64	80	75	40	55	64
$Y$ :	62	58	68	45	81	60	68	48	50	70

2. a) From a city population, the probability of selecting
- 
- (I) a male (or) a smoker is
- $7/10$
- , (II) a male smoker is
- $2/5$
- and
- 
- (III) a male, if smoker is already selected is
- $2/3$
- .

Find the probability of selecting

(i). A non-smoker (ii). a male and (iii). a smoker, if a male is first selected.

- b) From a vessel containing 3 white & 5 black balls, 4 balls are transferred into an empty vessel. From this vessel a ball is drawn and is found to be white. What is the probability that out of four balls transferred 3 are white and 1 is black?

3. a) A random variable
- $X$
- has the following probability distribution.

$X$ :	0	1	2	3	4	5	6	7	8
$P(X)$ :	5	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$	$15k$	$17k$

Find (i)  $k$  (ii)  $P(X \geq 3)$ (iii) What if the smallest value of  $x$  for which  $P(X \leq x) > 0.5$ .

- b) A random variable
- $X$
- is distributed at random between the values 0 and 1, so that its probability density function is
- $f(x) = kx^2(1-x^3)$
- , where
- $k$
- is a constant.

Find (i)  $k$  (ii) mean (iii) standard deviation.

4. a) In a binomial distribution consisting of 5 independent trials, probabilities are 1 and 2 success are 0.4096 and 0.2048 respectively. Find the parameter
- $p$
- of the distribution.
- 
- b) A manufacturer, who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles, using poisson distribution, find how many boxes will contain (i) no defective (ii) atleast two defectives.



5. a) The mean of certain normal population is equal to the standard error of the mean of the samples of 64 from that distribution. Find the probability that the mean of the sample size 36 will be negative.
- b) What is the effect on standard error, if a sample is taken from an infinite population of sample size is increased from 400 to 900.
6. a) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487/- with a S.D of Rs. 48/-. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between Rs. 472 to Rs.502
- b) To estimate the average amount of time, visitors take to move from one building to another in an office complex, the mean of a random sample of size 'n' is used. Given  $\sigma = 1.40$  minutes, determine how large should be the sample size if it is ascertained with 99% confidence that the error  $E$  is atmost 0.25.
7. a) A sample of 400 male students is found to have a mean height of 171.38cm can it be reasonably regarded as a sample from a large population with mean height of 171.17cm and S.D 3.30cm
- b) Two random samples drawn from normal populations are:  
 I : 20 16 26 27 23 22 18 24 25 19 - -  
 II : 27 33 42 35 32 34 38 28 41 43 39 37
- Test whether the two populations have the same variance.
8. Four methods are under development for making discs of a super conduction material. Fifty discs are made by each method and they are checked for super conductivity when cooled with liquid.

	Method I	Mehod II	Mehod III	Mehod IV
Super conductors	31	42	22	25
Failures	19	8	28	25

Test the significant difference between the proportions of conductors at 0.05 level.

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