

BTS – V(SS) – 06.14 – 0508

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**B.Tech. Degree V Semester Special Supplementary  
Examination June 2014**

**IT/CS/CE/SE/ME/EE/EB/EC/EI/FT 501 ENGINEERING MATHEMATICS IV**  
(2006 Scheme)

Time : 3 Hours

Maximum Marks : 100

**PART A**  
(Answer ALL questions)

(8 × 5 = 40)

- I. (a) Find the mean and variance of a random variable having density function

$$f(x) = \begin{cases} 12x^2(1-x), & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

- (b) For a binomial distribution with  $n = 6$ , the third term is nine times the fifth term. Find 'P'.  
(c) A random sample of 900 items with mean 3.5 and standard deviation 2.61 is drawn from a normal population. Determine a 95% C.I. for  $\mu$ .  
(d) Briefly explain the procedure for testing of hypothesis.

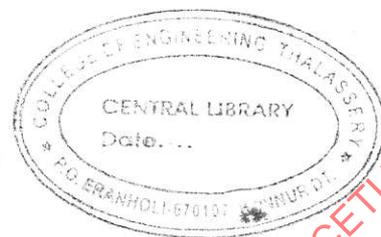
(e) Prove that  $1 + \mu^2 \delta^2 = \left(1 + \frac{1}{2} \delta^2\right)^2$ .

- (f) From the following table find the missing value

x:	2	3	4	5	6
y:	45.0	49.2	54.1	-	67.4

- (g) Solve  $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$  at  $x = 0.1$  using Taylor series method.

- (h) Evaluate  $\int_0^1 \frac{1}{1+x^2} dx$  using Trapezoidal rule taking  $h = 0.2$ .



**PART B**

(4 × 15 = 60)

- II. (a) Between the hours of 2 and 4 p.m. the average number of phone calls per minute coming into the switch board of a company is 2.5. Find the probability that during one particular minute there will be  
(i) no phone call at all  
(ii) exactly 2 calls  
(iii) at least 5 calls  
(b) In a competitive examination 5000 students have appeared for a paper in Statistics. Their average mark was 62 and standard deviation was 12. If there are only 100 vacancies find the minimum marks that one should score in order to get selected.

**OR**

- III. (a) Find the rank correlation coefficient for the following data
- |    |     |     |     |     |     |    |    |    |    |    |
|----|-----|-----|-----|-----|-----|----|----|----|----|----|
| x: | 100 | 101 | 102 | 100 | 100 | 99 | 97 | 98 | 96 | 95 |
| y: | 98  | 99  | 99  | 97  | 95  | 96 | 95 | 94 | 90 | 96 |
- (b) Fit a good straight line to the following data. Also calculate  $y$  when  $x = 14$ .
- |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|
| x: | 10 | 11 | 12 | 13 | 16 | 17 | 20 | 25 |
| y: | 10 | 22 | 24 | 27 | 29 | 28 | 33 | 37 |

(P.T.O.)

- IV. (a) A stenographer claims that she can take dictations at the rate of more than 120 words per minute. Of the 12 tests given to her she could perform an average of 135 words with a standard deviation of 40. Is her claim valid? ( $\alpha = .01$ )
- (b) Ten soldiers visit a rifle range for 2 consecutive weeks. For the first week, their scores are 67, 24, 57, 55, 63, 54, 56, 68, 33, 43 and during second week, they score in the same order 70, 38, 58, 58, 56, 67, 68, 72, 42, 38. Examine, if there is significant difference in their performance.

OR

- V. (a) For a sample of 100 labourers from Kerala, the average daily wages is ₹10.50 with S.D. ₹1.50. For a sample of 150 labourers from Tamil Nadu the corresponding figures are ₹8.00 and ₹1.00 respectively. Can you conclude that average wages of workers in Kerala are more than that of workers in Tamil Nadu?
- (b) The time taken by workers in performing a job by method I and method II are given below:
- |            |    |    |    |    |    |    |
|------------|----|----|----|----|----|----|
| Method I:  | 20 | 16 | 26 | 25 | 23 |    |
| Method II: | 28 | 33 | 42 | 35 | 52 | 34 |
- Does the data show that variance of time distribution by 2 methods do differ significantly?

- VI. (a) Using Stirlings formula find  $y(35)$  from the following:
- |    |     |     |     |     |
|----|-----|-----|-----|-----|
| x: | 20  | 30  | 40  | 50  |
| y: | 512 | 439 | 346 | 243 |

- (b) Evaluate  $\int_0^6 \frac{1}{1+x} dx$  using
- (i) Simpson's 1/3 rule
  - (ii) Simpson's 3/8 rule

OR

- VII. (a) Using Lagrange interpolation find  $y(10)$  from the following
- |    |    |    |    |    |
|----|----|----|----|----|
| x: | 5  | 6  | 9  | 11 |
| y: | 12 | 13 | 14 | 16 |

- (b) Find  $f'(10)$  and  $f''(10)$  from the following:
- |        |         |       |       |        |        |
|--------|---------|-------|-------|--------|--------|
| x      | : 10    | 11    | 12    | 13     | 14     |
| $f(x)$ | : 40.62 | 60.80 | 79.95 | 103.56 | 132.65 |

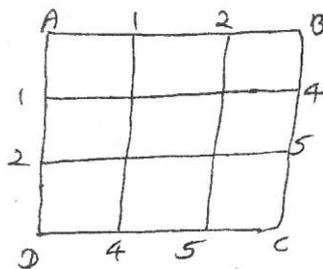
- VIII. (a) Use Range-kutta method to find the value of  $y$  when  $x = 0.2$  in steps of 0.1 if  $\frac{dy}{dx} = x^2 + 2y$ ,  $y(0) = 0$ .

- (b) Solve  $U_{xx} - 2U_t = 0$ , given  $u(0, t) = 0$ ,  $u(4, t) = 0$ ,  $u(x, 0) = x(4 - x)$ . Assume  $h = k = 1$ . Find the values of  $u$  upto  $t = 5$ .

OR

- IX. (a) Given  $\frac{dy}{dx} = \frac{y-x}{y+x}$ , with  $y = 1$  for  $x = 0$ . Find  $y$  approximately for  $x = 0.1$  by Euler's method taking  $h = 0.02$ .

- (b) Solve the elliptical equation  $U_{xx} + U_{yy} = 0$ .



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**B. Tech. Degree V Semester Special Supplementary  
Examination June 2014**

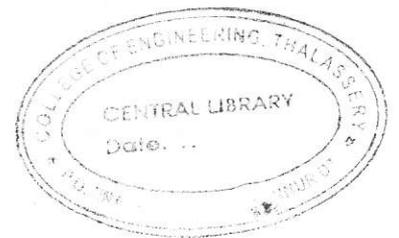
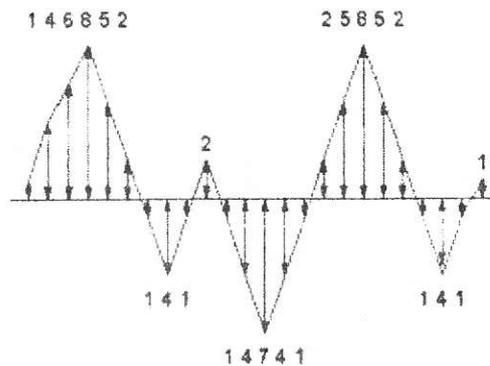
**ME 502 METROLOGY AND MACHINE TOOLS  
(2006 Scheme)**

Time: 3 Hours

Maximum Marks: 100

**PART A  
(Answer ALL questions)**

- I. (a) A shaft has a diameter 30mm with upper and lower deviations being +0.05 and -0.02 respectively. Similarly the upper and lower deviations of the hole of basic size 29.95mm are +0.07 and -0.03 respectively. Identify the type of fit. Also calculate the Max./Min. clearance or interference, which so ever is applicable to this problem. (8 x 5 = 40)
- (b) Two measuring instruments A and B are used for measuring the diameter of a ring. The corresponding readings in mm are given below. Assuming that the measurements are made under similar circumstances and its true value is 23.02mm. Identify which equipment is more precise based on the given data with proper mathematical explanation.
- |              |       |       |       |       |       |       |       |
|--------------|-------|-------|-------|-------|-------|-------|-------|
| Instrument A | 23.04 | 23.03 | 23.01 | 23.02 | 22.99 | 23.02 | 23.01 |
| Instrument B | 23.02 | 22.98 | 23.00 | 23.04 | 23.01 | 22.99 | 23.01 |
- (c) Select an appropriate set of angle gauges for measuring an angle 23° 33' 12". Assume that the available angle gauge set consists of angle gauges 1°, 3°, 9°, 27°, 41°, 1', 3', 9', 27', 3", 6", 18" and 30".
- (d) The numbers shown in the figure below are the deviations about the reference surface in  $\mu m$ . Calculate the RMS and CLA values of roughness assuming equal spacing between the subsequent locations where the measurements are made.



- (e) Discuss about any one of the quick return mechanism used in shaping machine with a neat sketch.
- (f) Write a short note on up milling and down milling with appropriate sketches.
- (g) Differentiate between reaming, broaching and trepanning.
- (h) Discuss the application of honing and lapping with an appropriate example.

**PART B**

- II. A shaft and a hole pair is designated as 40H7g6. Design an appropriate GO and NOGO gauge using Taylor's principle of gauge design. Assume the diameter step to which the basic size belongs to in this problem as 30mm to 50mm. The fundamental deviation of the shaft is given by the equation  $-2.5D^{0.34}$ . Assume gauge maker's tolerance in this problem to be as .10% of the working tolerance. Neglect wear allowance. (15)

OR

(P.T.O.)



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B

**B.Tech. Degree V Semester Special Supplementary  
Examination June 2014**

**ME 503 MECHANICS OF MACHINERY  
(2006 Scheme)**

Time : 3 Hours

Maximum Marks : 100

**PART A  
(Answer ALL questions)**

(8 × 5 = 40)

- I. (a) Sketch and explain any two inversions of a double slider crank chain.  
(b) Derive an expression for the magnitude of coriolis component of acceleration.  
(c) Explain the overlay method in the synthesis of mechanisms.  
(d) Explain the method of obtaining the coordinates of a coupler point in a slider crank mechanism.  
(e) Compare the characteristics of cycloidal and involute gears.  
(f) State and prove the law of gearing.  
(g) Derive an expression for displacement and velocity of a tangent cam operating on a radial-translating roller follower, when the contact is on the straight flank.  
(h) Derive an expression for the effort required to raise a load with a screw jack taking friction into consideration.

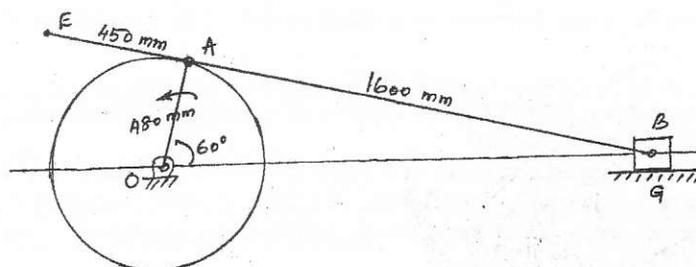
**PART B**

(4 × 15 = 60)

- II. (a) Explain the following terms:  
(i) Kinematic pair  
(ii) Kinematic chain  
(iii) Mechanism  
(iv) Inversion  
(b) A four bar mechanism has the following dimensions:  
DA = 300mm; CB = AB = 360mm; DC = 600mm. The link DC is fixed and the angle ADC is 60°. The driving link DA rotates uniformly at a speed of 100 rpm clockwise. Determine the velocity of the point 'B' and the angular velocity of the driven link CB.

**OR**

- III. For the configuration of a slider crank mechanism shown in figure, determine  
(i) The acceleration of the slider at B,  
(ii) The acceleration of point E  
(iii) The acceleration of link AB  
OA rotates at 20 rad/s counter-clockwise.



(P.T.O.)

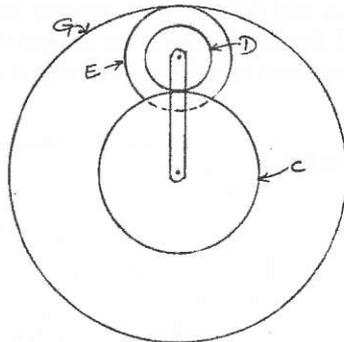
- IV. (a) Derive the Freudenstein's equation in the analysis of four bar mechanisms. (5)  
 (b) Synthesize a four bar linkage to generate  $y = \log_{10} x$  in the interval  $1 \leq x \leq 10$ . The input crank length is 5cm. The input crank is to rotate from  $45^\circ$  to  $105^\circ$  while the output crank moves from  $135^\circ$  to  $225^\circ$ . Use three accuracy points with Chebychev's spacing. (10)

OR

- V. (a) Obtain the maximum and minimum transmission angles for a four link mechanism. (5)  
 (b) Explain what is meant by direct kinematic and inverse kinematic transformations. (10)
- VI. (a) Derive an expression for the length of path of contact between a pair of meshing gear teeth. (5)  
 (b) Two gears in mesh have a module of 8mm and a pressure angle of  $20^\circ$ . The larger gear has 57 while the pinion has 23 teeth. If the addenda on pinion and gear wheel are equal to one module, determine (10)  
 (i) The number of pairs of teeth in contact  
 (ii) The ratio of the sliding to rolling velocity at  
 (a) the beginning of contact  
 (b) the pitch point  
 (c) the end of contact

OR

- VII. (a) Explain the different types of gear trains. (5)  
 (b) Two shafts A and B are co-axial. Gear C (50 teeth) is rigidly mounted on shaft A. Compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. If the shaft A rotates at 110 rpm, determine the speed of shaft B, assuming that all gears have the same module. (10)



- VIII. (a) Define the following terms as applied to cam with a neat sketch. (5)  
 (i) Base circle  
 (ii) Pitch circle  
 (iii) Pressure angle  
 (iv) Stroke of the follower
- (b) Draw the profile of a cam operating a knife-edge follower having a lift of 30mm. The cam raises the follower with SHM for  $150^\circ$  of its rotation followed by a period of dwell for  $60^\circ$ . The follower descends for the next  $100^\circ$  rotation of the cam with uniform velocity, again followed by a dwell period. The least radius of the cam is 20mm. (10)

OR

- IX. (a) Derive an expression for the friction moment of a conical pivot assuming (i) uniform pressure and (ii) uniform wear. (5)  
 (b) A load of 10kN is raised by means of a screw jack, having a square threaded screw of 12mm pitch and of mean diameter 50mm. If a force of 100N is applied at the end of a lever to raise the load. What should be the length of the lever used? Take coefficient of friction = 0.15. (10)

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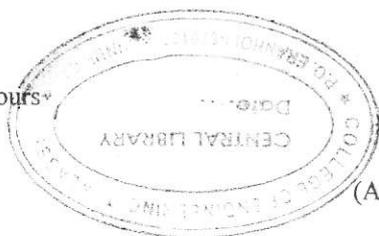
A

***B.Tech. Degree V Semester Special Supplementary  
Examination June 2014***

**ME 504 THERMAL ENGINEERING  
(2006 Scheme)**

Time : 3 Hours

Maximum Marks : 100



**PART A**  
(Answer *ALL* questions)

(8 × 5 = 40)

- I. (a) Explain a dual cycle with a neat sketch.  
(b) Sketch and explain the valve timing diagram of a four stroke petrol engine.  
(c) Briefly explain supercharging and turbocharging in IC engines.  
(d) What is cetane number? How it is related to ignition delay time?  
(e) Explain supersaturated flow in steam nozzles.  
(f) Classify steam turbines and differentiate between steam turbines and steam engines.  
(g) Explain a simple open cycle gas turbine with a neat diagram.  
(h) Compare the axial flow compressor with centrifugal compressor.

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**PART B**

(4 × 15 = 60)

- II. (a) A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of stroke. Find the air standard efficiency of the engine. Take  $\gamma$  for air as 1.4. (8)  
(b) Briefly explain scavenging in two stroke cycle engines. (7)
- OR**
- III. An oil engine takes in air at 1.01 bar, 20°C and the maximum cycle pressure is 69 bar. The compression ratio is 18. Calculate the air standard thermal efficiency based on dual combustion cycle. Assume that heat added at constant volume is equal to the heat added at constant pressure. (15)
- IV. Explain with the help of sketches ignition system for a spark ignition engine. (15)
- OR**
- V. Explain the knocking phenomenon in C.I. engines and compare it with that of S.I. engines. Discuss the effect of operating variables on delay period and diesel knock. (15)

(P.T.O.)

- VI. (a) Determine the mass flow rate of steam through a nozzle having isentropic flow through it. Steam enters nozzle at 10 bar, 500°C and leaves at 6 bar. Cross-section areas at exit of nozzle is 20cm<sup>2</sup>. Velocity of steam entering nozzle may be considered negligible. Show the process on h-s diagram. (9)
- (b) Explain the effect of back pressure in a convergent nozzle. (6)

OR

- VII. (a) Describe the velocity diagram for single stage impulse turbine. (6)
- (b) In a single stage simple impulse turbine the steam flows at the rate of 5kg/s. It has rotor of 1.2m diameter running at 3000 rpm. Nozzle angle is 18°, blade speed ratio is 0.4, velocity coefficient is 0.9, outlet angle of blade is 3° less than inlet angle. Determine the blade angles and power developed. (9)

- VIII. A gas turbine unit has a pressure ratio of 10/1 and a maximum cycle temperature of 700°C. The isentropic efficiencies of the compressor and turbine are 0.82 and 0.85 respectively. Calculate the power output of an electric generator geared to the turbine when the air enters the compressor at 15°C at the rate of 15 kg/s. Take  $C_p = 1.005\text{kJ/kg-K}$  and  $\gamma = 1.4$  for the compression process and take  $C_p = 1.11\text{kJ/kg-K}$  and  $\gamma = 1.333$  for the expansion process. Also determine the cycle efficiency and work ratio of the plant assuming that  $C_p$  for the combustion process is 1.11kJ/kg-K. (15)

OR

- IX. (a) Describe the working of a roots blower with neat diagram. (8)
- (b) Briefly explain the factors affecting the design of combustion chamber of a gas turbine. (7)

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D

***B.Tech. Degree V Semester Special Supplementary  
Examination June 2014***

**ME 505 POWER PLANT ENGINEERING  
(2006 Scheme)**

Time : 3 Hours

Maximum Marks : 100

**PART A  
(Answer ALL questions)**

(8 x 5 = 40)

- I. (a) Define the following terms:  
(i) Plant capacity factor (ii) Diversity factor  
(iii) Load factor (v) Demand factor.
- (b) Explain base load power plant and peak load power plant.
- (c) Explain the different types of dams with neat sketch.
- (d) Illustrate the advantages and disadvantages of diesel power plant.
- (e) Explain fluidized bed combustion.
- (f) Explain the different types of condensers with neat sketch.
- (g) Explain nuclear fission.
- (h) Explain open cycle OTEC.



**PART B**

(4 x 15 = 60)

- II. (a) What are load curves? Explain the different types of load curves. (7)
- (b) A hydroplant is to be used as peak load at an annual load factor of 30%. The electrical energy obtained during the year is  $750 \times 10^5$  kwh. Determine the maximum demand if the plant capacity is 24%. (8)
- OR**
- III. Explain the different costs of energy. Explain the different methods to find depreciation cost. (15)
- IV. Explain the layout of a hydroelectric power plant with neat sketch. Also explain the various parts. (15)
- OR**
- V. (a) Explain open cycle gas turbine power plant. (8)
- (b) Explain site selection for hydroelectric power plant. (7)
- VI. Explain the layout of steam power plant with a neat diagram. (15)
- OR**
- VII. (a) Explain ash handling and dust handling systems with neat sketches. (8)
- (b) Explain boiler mountings and accessories. (7)
- VIII. (a) Explain MHD closed cycle system with advantages and disadvantages. (8)
- (b) Explain geothermal energy systems with neat sketches. (7)
- OR**
- IX. (a) What are the advantages and disadvantages of tidal power plants? (7)
- (b) Explain the working of a thermionic converter with neat sketch. (8)

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C

***B.Tech. Degree V Semester Special Supplementary  
Examination June 2014***

**ME 506 INDUSTRIAL MANAGEMENT  
(2006 Scheme)**

Time : 3 Hours

Maximum Marks : 100

**PART A  
(Answer ALL questions)**

(8 × 5 = 40)

- I. (a) What is an organizational chart?
- (b) Differentiate between recruitment and selection.
- (c) What is meant by industrial relations?
- (d) Explain collective bargaining.
- (e) Distinguish between standard costing and marginal costing.
- (f) What is budgeting?
- (g) Distinguish between marketing and selling.
- (h) Explain entrepreneurship.



**PART B**

(4 × 15 = 60)

- II. Explain the different types of organizational structures.
- OR
- III. Discuss the functions of personnel management.
- IV. What is the importance of industrial relations in the functioning of an enterprise?  
Discuss the activities related to industrial relations.
- OR
- V. What is a trade union? Explain the role of trade unions in industry.
- VI. Explain the functions of financial management in an organization.
- OR
- VII. Explain the elements of costs. How to arrive at the selling price of an item?
- VIII. What are the functions performed by a marketing department?  
OR
- IX. What is the importance of entrepreneurship development? Explain the factors affecting it.

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