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B.Tech. Degree V Semester Examination November 2014

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

Time : 3 Hours

Maximum Marks : 100

PART A (Answer ALL questions)

(8 x 5 = 40)

- I. (a) Obtain the distribution function and mean of the total number of heads occurring in three tosses of an unbiased coin.

- (b) A random variable X has density function $P(x) = \frac{1}{\pi(1+x^2)}$, $-\infty < x < \infty$.

Find the probability that x^2 lies between $\frac{1}{3}$ & 1.

- (c) Determine the coefficient of correlation between X and Y for the two regression lines $3x+2y=26$ and $6x+y=31$.
- (d) A sample of 900 members is found to have a mean of 3.4 cm. Can it be reasonably regarded as a random variable from a large population with mean 3.25cm and S.D 1.61cm.

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

- (f) Apply Lagrange's formula to evaluate $f(1)$ from the following data

x : -1 0 2 3

$f(x) = y$: -8 3 1 12

- (g) Evaluate $\int_4^{5.2} \log x dx$ using Simpson's $\frac{1}{3}$ rule taking $h = 0.2$

- (h) Solve by Euler's method, $\frac{dy}{dx} = x + y$; $y(0) = 1$.

Find $y(0.2)$, $y(0.4)$ and $y(0.6)$



PART B

(4 x 15 = 60)

- II. (a) Derive the mean and variance of Poisson distribution.
- (b) In a normal distribution 17% of the items are below 30 and 17% of the items are above 60. Find the mean and standard deviation.

OR

- III. (a) Fit a curve of the form $y = ae^{bx}$ to the following data by the method of least squares

x	:	0	5	8	12	20
y	:	3	1.5	1	0.55	0.18

- (b) Derive the mean and variance of binomial distribution.

(P.T.O.)

- IV. (a) Define (i) significance level (ii) type I & II errors (iii) point estimation in sampling theory.
- (b) A machine is supposed to produce washers of mean thickness of 0.12cm. A sample of 10 washers was found to have mean thickness of 0.12cm and S.D 0.008. Test whether the machine is working in proper order at 5% of significance level.

OR

- V. (a) A random sample of size 15 is taken from $N(\mu, \sigma^2)$ has $\bar{X} = 3.2$ and $S^2 = 4.24$. Obtain a 90% confidence interval for σ^2 .
- (b) The mean of simple random samples of sizes 1000 and 2000 are 67.5 and 68 cm respectively. Can the samples be regarded as drawn from same population of S.D 2.5cm.
- VI. (a) Represent $x^4 - 12x^3 + 42x^2 - 30x + 9$ and its successive forward difference in factorial polynomials taking $h = 1$.
- (b) Prove that $\left(\frac{\Delta^2}{E}\right)e^x, \frac{Ee^x}{\Delta^2 e^x} = e^x$, taking h as the interval of differencing.

OR

- VII. (a) Use Lagrange's interpolation formula to fit a polynomial to the data
- | | | | | |
|-----|-----|---|---|----|
| x : | 0 | 1 | 3 | 4 |
| y : | -12 | 0 | 6 | 12 |
- (b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{3}{8}$ rule taking $h = \frac{1}{6}$
- VIII. (a) Apply Runge-kutta fourth order formula to evaluate $y(0.1)$ where $\frac{dy}{dx} = x^2 + y^2$; $y(0) = 1$
- (b) Apply Newton's divided difference formula to evaluate $f(2)$ from the following table
- | | | | | | | |
|--------|----|-----|-----|-----|------|------|
| x : | 4 | 5 | 7 | 10 | 11 | 13 |
| f(x) : | 48 | 100 | 294 | 900 | 1210 | 2028 |

OR

- IX. Solve the Laplace equation.

		11.1	17	19.7	
0		41	42	43	18.6
0		44	45	46	21.9
0		47	48	49	21
0					17
0		8.7	12.1	12.8	9

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B.Tech. Degree V Semester Examination November 2014

ME 502 METROLOGY AND MACHINE TOOLS (2006 Scheme)

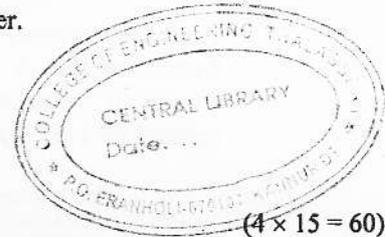
Time : 3 Hours

Maximum Marks : 100

PART A (Answer ALL questions)

(8 × 5 = 40)

- I. (a) Explain the parts of an external micrometer, with the help of a neat sketch. Also describe 'least count'.
- (b) Explain the process of gauging. With neat sketches explain limit caliper gauge and snap gauge.
- (c) Describe the use of sine bar with necessary diagram.
- (d) Enumerate on CLA & RMS values.
- (e) What are the differences between orthogonal cutting and oblique cutting?
- (f) Brief the operational and usage differences of shaper and planer.
- (g) Describe the process of centerless grinding.
- (h) Explain the finishing processes— honing and lapping.



PART B

(4 × 15 = 60)

- II. With a neat sketch, explain the uses of bevel protractor, for measurements.
- OR**
- III. Explain interchangeability and selective assembly, with their advantages and disadvantages.
- IV. Explain the working principle and uses of profile projector with the help of neat diagrams.
- OR**
- V. Explain 'Autocollimator', with the aid of a schematic diagram.
- VI. Describe the differences of Capstan and Turret lathes.
- OR**
- VII. With the help of neat sketches, name and explain the nomenclature of a twist drill.
- VIII. Explain the various elements of plain milling cutter, with neat sketch.
- OR**
- IX. Describe the types of motion control of tools in NC systems, with necessary diagrams.

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B.Tech. Degree V Semester Examination November 2014

ME 503 MECHANICS OF MACHINERY (2006 Scheme)

Time : 3 Hours

Maximum Marks : 100

PART A

(Answer ALL questions)

(8 x 5 = 40)

- I. (a) Derive an expression for the ratio of times taken in forward and return stroke in a *Crank and Slotted Lever* quick return motion mechanism.
- (b) Sketch and explain any two inversions of a double slider crank chain.
- (c) Explain the method of obtaining the co-ordinates of a coupler point in a four bar mechanism.
- (d) Obtain the Freudenstein's equation for a four bar mechanism.
- (e) Derive an expression for the length of path of contact for a pair of meshing gear teeth.
- (f) Define (i) Pressure angle and (ii) Circular pitch, related to spur gears.
- (g) State the laws of static friction.
- (h) Derive an expression for the frictional torque in flat pivot friction considering uniform pressure condition.

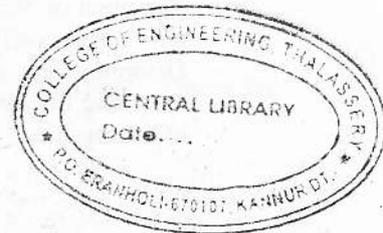
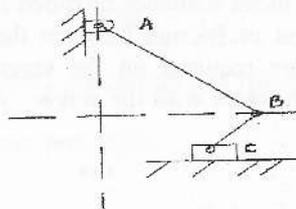
PART B

(4 x 15 = 60)

- II. (a) State and prove Kennedy's three centres in line theorem. (5)
- (b) A pin jointed four bar mechanism has various dimensions as follows: (10)
 $AB = 300\text{mm}$, $BC = CD = 360\text{mm}$, $AD = 600\text{mm}$ and Angle $BAD = 60^\circ$. Link AD is fixed. The crank AB rotates uniformly at 10 rad/s in the clockwise direction. Using Instantaneous centre method, determine (i) angular velocity of link BC and (ii) velocity of point E on link BC, at a distance of 200mm from B.

OR

- III. (a) Derive an expression for the magnitude of Coriolis component of acceleration. (5)
- (b) In the mechanism shown in figure, the slider C is moving to the left with a velocity of 1.0 m/s and an acceleration of 2.5 m/s^2 . The dimensions of various links are $AB = 3\text{m}$ inclined at 45° with the vertical and $BC = 1.5\text{m}$ inclined at 45° with the horizontal. Determine the angular acceleration of the links AB and BC. (10)



(P.T.O.)

- IV. (a) Explain the overlay method in the design of mechanisms. (5)
 (b) Explain the direct and inverse kinematic transformations as applied to robot mechanisms. (10)

OR

- V. (a) Calculate the maximum and minimum transmission angles for a slider crank mechanism. (5)
 (b) For the four bar linkage, the following data are given; $\theta = 60^\circ$, $\phi = 90^\circ$, $\omega_{IP} = 3 \text{ rad/s}$, $\omega_{OP} = 2 \text{ rad/s}$, $\alpha_{IP} = -1 \text{ rad/s}^2$ and $\alpha_{OP} = 0 \text{ rad/s}^2$. Determine the link-length ratios. Sketch the mechanism taking the length of the shortest link as 30mm. θ and ϕ are the input crank angle and output follower angle respectively. (10)

- VI. (a) State and prove the law of gearing. (5)
 (b) The following data refer to two mating involute gears of 20° pressure angle: (10)
- | | | |
|---------------------------|---|---------|
| Number of teeth on pinion | = | 20 |
| Gear Ratio | = | 2 |
| Speed of pinion | = | 250 rpm |
| Module | = | 12 mm |

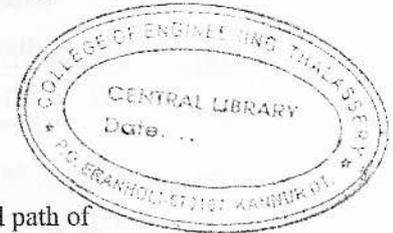
If the addendum of each wheel is such that the path of approach and path of recess on each side are half the maximum possible length each, find (i) addendum for both the wheels (ii) the length of arc of contact and (iii) the maximum velocity of sliding during approach and recess.

OR

- VII. (a) Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth. (5)
 (b) In a *reverted* epicyclic gear train, the arm A carries two wheels B and C and a compound wheel D-E. The wheel B gears with E and the wheel C gears with wheel D. The number of teeth on wheels B, C and D are 150, 60 and 180 respectively. Determine the speed and direction of wheel C when B is fixed and the arm A makes 200 rpm counter clockwise. (10)
- VIII. (a) Derive an expression for displacement and velocity for a tangent cam operating on a radial-translating roller follower, when the contact is on the straight flank. (5)
 (b) Draw the profile of a cam operating roller follower with the following data: (10)
 Minimum radius of cam : 25mm, lift : 30mm, roller diameter : 15mm.
 The cam lifts the follower for 120° with uniform acceleration and deceleration followed by a dwell period of 30° . Then the follower lowers down during 150° of the cam rotation with SHM followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during the descent period.

OR

- IX. (a) Derive an expression for the efficiency of a screw jack. (5)
 (b) The pitch of 50mm mean diameter threaded screw of a screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25kN, assuming the load to rotate with the screw. Also determine the efficiency of the machine. (10)



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B.Tech. Degree V Semester Examination November 2014

ME 504 THERMAL ENGINEERING (2006 Scheme)

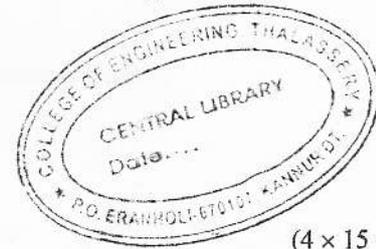
Time: 3 Hours

Maximum Marks: 100

PART A (Answer ALL questions)

(8 × 5 = 40)

- I. (a) Explain the effect of spark advance on the performance of an Otto cycle engine.
- (b) Briefly explain scavenging in IC engines.
- (c) Describe octane number and cetane number.
- (d) Sketch a lubrication system used in an IC engine and explain its working.
- (e) Describe velocity triangle for a reaction turbine.
- (f) Briefly explain effect of friction on blades.
- (g) Briefly explain the combustion chambers of gas turbines.
- (h) Briefly explain the working of centrifugal air compressor.



PART B

(4 × 15 = 60)

- II. The pressure and temperature are 1 bar and 35 deg. C at the beginning of a cycle and its compression ratio is 10. Fix the maximum temperature at 1000 deg. C and calculate the efficiencies of Otto and Diesel cycles for these conditions. (15)

OR

- III. (a) Explain Morse test. (7)
- (b) Explain with sketch the valve-timing diagram of a four stroke petrol engine. (8)
- IV. (a) Explain the different phases of combustion. (7)
- (b) Explain the different types of cooling systems in IC engines. (8)

OR

- V. Briefly explain:
 - (i) Alternate potential engines. (7)
 - (ii) How is pre ignition detected? (8)

- VI. An impulse turbine has one nozzle per stage. The angle of inclination of nozzle is 22 deg. and tip angles of blades are 35 deg. If the velocity of steam at exit from the nozzle is 800 m/s, find blade speed, so that the steam shall pass on without shock. Also find the corresponding diagram efficiency. (15)

OR

- VII. (a) A convergent-divergent nozzle is required to discharge 2kg of steam per second. The nozzle is supplied with steam at 6.9 bar and 180 deg.C and discharge takes place against a back pressure of 0.98 bar. Expansion up to throat is isentropic and the frictional resistance between the throat and exit is equivalent to 62.76 KJ/Kg of steam. Taking approach velocity of 75m/s and throat pressure 3.9 bar estimate the suitable areas for the throat and exit. (15)
- (b) Describe aggregate planning.

- VIII. (a) Briefly explain combustion intensity and combustion efficiency. (7)
- (b) Compare open cycle and closed cycle gas turbine plants. (8)

OR

- IX. A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 600 deg.C. The isentropic efficiencies of the compressor and turbine are 0.8 and 0.82 respectively. Calculate the power output when the air enters the compressor at 15 deg.C. at the rate of 16Kg/S. $C_p = 1.005 \text{ KJ/KgK}$, $r = 1.4$ for compression process and $C_p = 1.11 \text{ KJ/KgK}$, $r = 1.33$ for expansion process. (15)

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B.Tech. Degree V Semester Examination November 2014

ME 505 POWER PLANT ENGINEERING (2006 Scheme)

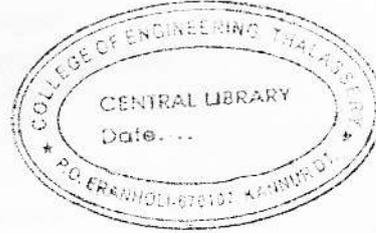
Time: 3 Hours

Maximum Marks: 100

PART A (Answer ALL questions)

(8 × 5 = 40)

- I. (a) Explain what you understand by base load and peak load. Why are base load plants loaded heavily?
- (b) How is the load-duration curve constructed?
- (c) What is a surge tank? Why is it important in a hydro-plant?
- (d) What are the advantages and disadvantages of diesel engine power plants?
- (e) What is a stoker? What are the different types of stokers?
- (f) Explain a fission chain with an example.
- (g) Explain OTEC.
- (h) Write a note on MHD.



PART B

(4 × 15 = 60)

- II. A generating unit of 10MW capacity supplies the following loads: (15)
 - (i) Domestic consumers with a maximum demand of 6MW at a load factor of 20%.
 - (ii) Small industrial load with a maximum demand of 3.6MW at a load factor of 50%.
 - (iii) Street light load with a maximum demand of 400KW at 30% load factor. Capital cost of the plant: ₹10,000 per KW. Total running cost: ₹36,00,000 per year. Find the overall cost of energy per kWh for each type of consumer.
- OR
- III. (a) Briefly explain the effect of load factor on cost of energy. (7)
- (b) A thermal power plant of 210 MW capacity has the maximum load of 160MW. Its annual load factor is 0.6. The coal consumption is 1kg per kWh of energy generated and the cost of coal is ₹45,000/- per tonne. Calculate the annual revenue if energy is sold at ₹3.75 per kWh and the capacity factor of the plant. (8)
- IV. (a) How are dams classified? Briefly describe important types of dams. How would you select the site of a dam? (7)
- (b) In a hydroelectric power plant, (8)

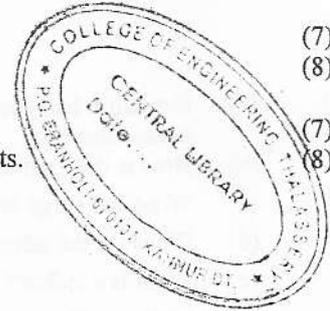
Available head	=	27m
Catchment area	=	430 sq.km
Rainfall	=	150cm/year
Percentage of rainfall utilized	=	65%
Penstock efficiency	=	95%
Turbine efficiency	=	80%
Generator efficiency	=	86%
Load factor	=	0.45

Calculate the power developed and suggest a suitable turbine for the plant.

OR

(P.T.O.)

- V. (a) Describe the application of diesel power plants in power supply systems. What are the merits and demerits of diesel power plants? (7)
(b) What are the merits and demerits of gas turbine power plants? Briefly explain regeneration, intercooling and reheating in a gas turbine plant. (8)
- VI. (a) What is a fluidized bed? What is the minimum fluidization velocity? (7)
(b) Briefly explain different types of furnaces in which coal may be burnt. (8)
- OR**
- VII. (a) Explain the function of a moderator and the criteria for selection of moderator. (7)
(b) Explain the various components of a nuclear power plant. (8)
- VIII. (a) Explain fuel cells. (7)
(b) Explain the principle of thermionic power generation. (8)
- OR**
- IX. (a) Explain the flat-plate and concentrating solar energy collectors. (7)
(b) Explain power generation by wind energy with merits and demerits. (8)



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B. Tech. Degree V Semester Examination November 2014

ME 506 INDUSTRIAL MANAGEMENT (2006 Scheme)

Time: 3 Hours

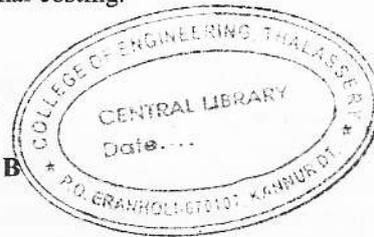
Maximum Marks: 100

PART A (Answer ALL questions)

(8 x 5 = 40)

- I. (a) Explain the skills of engineering manager.
- (b) What are the different methods to reduce labour turnover?
- (c) What are the causes of industrial disputes?
- (d) Explain different types of wages.
- (e) Differentiate between standard and marginal costing.
- (f) Briefly explain valuation of stocks.
- (g) Briefly explain marketing mix.
- (h) State the major functions of entrepreneur.

PART B



(4 x 15 = 60)

- II. What is meant by organizational change? What are the causes of organizational change? Explain the change process and response to change. (15)

OR

- III. (a) List the objectives of personnel management. (5)
- (b) Briefly explain the selection process in an organization. (10)
- IV. (a) What are the different methods employed for settling industrial disputes? Explain any one in detail. (7)
- (b) Briefly explain the following industrial disputes: (8)
 - (i) Strikes
 - (ii) Lock outs
 - (iii) Gherao
 - (iv) Picketing

OR

- V. (a) Explain the importance of good wage payment system. (5)
- (b) Briefly explain the following wage incentive plans with their advantages and disadvantages. (10)
 - (i) Halsey plan
 - (ii) Rowan plan

- VI. (a) Explain the principle of valuation of a firm. (5)
- (b) Explain the cost structure with the help of cost ladder. (10)

OR

(P.T.O.)

- VII. Briefly explain the following investment decision methods: (15)
- (i) Payback period method
 - (ii) Average rate of return
 - (iii) Discounted cash flow method

- VIII. (a) What are the differences between marketing and selling? (7)
(b) Briefly explain the physical distribution of goods. (5)
(c) Define inflation. (3)

OR

- IX. (a) Explain the steps involved in starting a small scale industry. (10)
(b) What are the various factors contributing to the failure of entrepreneurial ventures? (5)

