[03 – 2201]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2010
MECHANICAL ENGINEERING
MATHEMATICS – IV

Time: Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Show that the function *f(z)=xy+iy* is not analytic.

   (b) Evaluate $\int_{z-2}^{e^z} dz$, where C is the circle $|z| = 4$.

   (c) Define bilinear transformation.

   (d) Show that the root mean square deviation is least when measured from the mean.

   (e) What do you mean by null hypothesis?

   (f) Solve $(\Delta^2 - 3\Delta + 2)y_n = 0$.

   (g) Define Z-transform.

PART B

2. (a) Prove that the function $f(z)$ defined by $f(z) = \frac{x^3\left((1+i)-y^3(1-i)\right.}{x^2+y^2}$ $z \neq 0$ and $f(0) = 0$ is continuous and the C-R equations are satisfied at the origin.

   (b) If $f(z) = u + iv$ is an analytic function of $z = x + iy$ *and* $u - v = e^x\ (cos\ y - \sin y)$, then find $f(z)$.

3. (a) State and prove the Cauchy's integral formula.

   (b) Expand the following function in Laurent series $f(z) = \frac{1}{(z-1)(z-2)}$ in the region

   (i) $1 < |z| < 2$

   (ii) $0 < |z - 1| < 1$

4. (a) Determine the poles and the residue at each pole of the function $f(z) = \frac{z+4}{(z^2+2z+5)}$

   (b) Evaluate $\int_{-\infty}^{\infty} \frac{1}{(x^2+a^2)(x^2+b^2)}\, dx$

5. (a) In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate $\bar{x}$, $\bar{y}$ and the coefficient of

correlation between x and y.

(b) If the probability of a bad reaction from a certain injection is 0.001, determine the change that out of 2000 individuals more than two will get a bad reaction.

6. (a) The means of simple samples of size 1000 and 2000 size are 67.5 and 68.0 cm respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5cm?

(b) A certain stimulus administered to each of 12 patients resulted in the following change in blood pressure :

5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6.

Can it be concluded that the stimulus will increase the blood pressure?

7. (a) Solve $u_{n+2-4u_{n+1}}+4u_{n=n^2 2^n}$

(b) Solve the simultaneous difference equations :

$y_{x+1}-z_x = 2(x+1), z_{x+1-y_x=-}2(x+1)$

8. (a) Find the Z-transform of

(i) $\frac{a^n}{n!}e^{-a}$

(ii) $(\cos\theta + i\sin\theta)^{n}$.

(b) Find $Z^{-1}\{(z-5)^{-3}\}$ when $|z| > 5$. Determine the region of convergence.

_____ [2514/I/10]

[03 – 2204]

II/IV B.E.DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

ELECTRICAL TECHNOLOGY

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Explain how does hysteresis loss occur in a magnetic material.

(b) Define self inductance and mutual inductance.

(c) Draw on the same diagram, the lead characteristics of

(i) D.C. Shunt motor and

(ii) D.C. series motor.

Give one application of each motor based on the load characteristics.

(d) Why is the S.C. test performed at reduced voltage on the H.V. side of the transformer?

Why is the core loss almost negligible in this test?

(e) Define the term "voltage regulation" as applied to an alternator. Can it be negative? If so, how? If not, why?

(f) A moving coil ammeter is connected to measure the current in an R-L series circuit. Though it is not a faulty meter, there is no reading when a.c. voltage is applied to the circuit. Give the reason.

(g) Draw the torque – speed characteristic of a 3 phase induction motor and indicate.

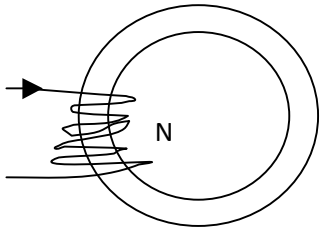
(i) The maximum torque point and

(ii) The starting torque point.

PART B

2. (a) State and explain in Faraday's law of electromagnetic induction. Using this law, explain dynamically induced e.m.f. and statically induced e.m.f.

(b) A magnetic circuit is shown in the figure below. The mean length of the ring is 60 cm. The cross – sectional area is 0.001 m^2. The absolute permeability is 0.06 H/m. Determine the magnetic flux in the circuit when I = 0.5 Amp and the number of turns N = 100.



3. (a) Develop from first principles, an expression for the e.m.f. of a d.c generator.

   (b) A 500 volts d.c. shunt motor takes 4 Amps on no load. The armature resistance is 0.2 ohm and shunt field current is 1 Ampere. Estimate the efficiency of the motor when the input current is 100 Amperes.

4. (a) Explain the following with respect to a.c. circuits.

   (i) Inductive reactance

   (ii) Capacitive reactance

   (iii) Power factor

   (iv) Active power

   (v) Apparent power

   (vi) Impedance

   (vii) Admittance.

   (b) A balanced star connected load of (8+j6) ohms per phase is connected to a 3-phase, 230 volts supply. Find the line current, power factor, power, reactive volts amperes and total volt amperes.

5. (a) With neat circuit diagrams, explain how do you conduct S.C. and O.C. tests on a 1-phase transformer.

   (b) A 7.5 KVA, single-phase transformer with a voltage ratio of 500/250 volts has primary resistance of 0.2 ohm and a leakage reactance of 0.6 ohm. The corresponding values for the secondary are 0.05 ohm and 0.15 ohm respectively. Find the terminal voltage at full load on the secondary at 0.8 p.f. lagging.

6. (a) Derive the torque equation of a 3 phase induction motor.

   (b) A 3-phase, 400/200 volts Y-Y connected slipping induction motor has 0.06 ohm per phase rotor resistance and 0.3 ohm per phase of rotor stand still reactance. Find the additional resistance required in the rotor circuit to make the starting torque equal to the maximum torque of the motor.
   Derive any formula used in solving this problem.

7. (a) Show that there is no starting torque available with 3-phase synchronous motor.

Name the various methods of starting a 3-phase synchronous motor and explain one method in detail.

(b) A 3-phase, 16 pole alternator has a star connected stator winding with 144 slots and to conductors per slot. The flux per pole is 0.03 wb, sine distributed, and the speed is 375 r.p.m. Find the frequency and the phase and line e.m.r.s under no load conditions.

8. (a) Describe the construction and principle of operation of moving coil voltmeter.

(b) Describe the constructions and principle of operation of electrical conductivity meter.

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[03 – 2211]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

ELECTRICAL TECHNOLOGY

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Define (i) MMF (ii) Magnetic flux and (iii) reluctance with respect to magnetic circuit. Give the relationship among them.

   (b) Define self inductance and mutual inductance.

   (c) Draw the load characteristics of (i) series motor and (ii) shunt motor on the same diagram. Give one application of each motor based on the load characteristics.

   (d) State the various losses in a transformer and state how they vary with load.

   (e) Draw the torque-slip characteristic and indicate the starting torque point and the maximum torque point.

   (f) Define the term "voltage regulation" with respect to alternator. Can it be negative? If so when? If not, why?

   (g) (i) Name the various methods of starting synchronous motor.

   (ii) "A moving coil ammeter can not be used in the a.c. circuits". Justify this statement.

2. (a) An iron ring of cross-sectional area of 10 cm2 is wound with a wire of 1500 turns has a saw cut of 3 mm air gap. Calculate the magnetizing current required to produce flux of 0.25 in wb if the mean length of the magnetic path is 50 cm and relative permeability of 470 and a leakage factor is 1.2.

   (b) Two coils A and B having turns of 200 and 500 respectively are wound side by side on a closed iron circuit of cross-sectional area 10 sq. cm and a mean length of 100 cm. The relative permeability of iron is 900. Compute the mutual inductance between the coils. What is the induced emf in coil B when the current in the coil A is increased from zero to 10 amps in 0.01 second?

3. (a) Explain the classification of D.C. generators and illustrate by means of their load characteristics. Give one application of each generator.

   (b) A 6 pole, 600 volts, D.C. shunt motor has a wave connected armature with 960 conductors. The flux per pole is 30 mWb. Calculate the torque developed by the armature and the useful torque in NW-m, when the current taken by the motor is 20 Amps. The armature

resistance is 0.1 ohm and the field resistance is 200 ohms. The rotational losses amount to 800 watts. Also, calculate the efficiency of the motor.

4. (a) A circuit consists of two coils connected in series to a 200 volts, 50 Hz a.c. supply. The first coil has a resistance of 5 ohms and inductive reactance of 10 ohms. The second coil has a resistance of 6 ohms and inductive reactance of 8 ohms. Calculate (i) the current and (ii) the power factor of the circuit.

   (b) A 3-phase load consists of three similar inductive coils, each of resistance 5 ohms and inductance 0.3 H. The supply is 415 volts, 50 Hz. Calculate (i) the line current (ii) the power factor and (iii) the total power when the load is STAR connected.

5. (a) Explain the tests to be conducted with circuit diagrams for predetermining the efficiency of the transformer.

   (b) A 600 KVA, 1-phase transformer has an efficiency of 92% both at full load and half full-load at unity p.f. Determine its efficiency at 60% of full load at 0.8 power factor lagging.

6. (a) Explain the principle of operation of 3-phase induction motor and state its applications.

   (b) A 3-phase, 50 Hz induction motor draws 50KW from the mains. If the stator loss is 2 KW and rotor e.m.f. is observed to make 100 complete oscillations (alternative) per minute, determine (i) rotor copperloss and (ii) gross mechanical power developed by the machine.

7. (a) Derive the E.M.F. equation of 3-phase alternator when the armature winding is chorded and distributed.

   (b) The input to a 11 KV, 3-phase, star connected synchronous motor is 60 Amps. The effective resistance and synchronous reactance per phase are 1 ohm and 30 ohms respectively. Find (i) the power supplied to the motor and (ii) the e.m.f. induced for a power factor of 0.8 lagging.

8. (a) Describe the construction and principle of operation of PMMC meter to measure current in a D.C. circuit.

   (b) Describe the construction and principle of operation of dynamometer type of wattmeter.

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[03 – 2206]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2010
MECHANICAL ENGINEERING
MANUFACTURING TECHNOLOGY - II
(Common for Mechanical and M.P.I. Engineering)
(Effective from the admitted batch of 1999-2000)

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) What are the reasons for formation of chips?
   (b) What are the factors that affect tool life?
   (c) What is Jig boring?
   (d) Classify drilling machines.
   (e) How is a grinding machine specified?
   (f) How is honing process carried out?
   (g) What is MRR?

PART B

2. (a) Derive an expression of chip reduction coefficient in single point cutting tool. State the assumptions used.
   (b) Explain single point cutting tool nomenclature as per American practice.
3. (a) Name and describe three methods of turning tapers on a lathe.
   (b) Explain the working of a horizontal boring machine.
4. Differentiate between shaping, planning and slotting machines as regards to relative tool and work motions.
5. (a) Explain the advantages of using a drill jig for mass production.
   (b) Describe the continuous type broaching machine.
6. Design a broaching tool for sizing round hole in a component which has been previously rough machined. Assume that no fixture is required and the thrust of the cut is taken on a approximately 1.5 mm large than the largest diameter of the broach. The other data are as given below:

Material to be broached	: Steel forging
Length of broached hoe	: 75 mm
Diameter of rough bored hole	: 31 mm
Diameter of finished hole	:32mm with tolerance of +0.00 and -0.0025mm

7. (a) Describe the various types of cutters used in milling machines.

   (b) Explain the classification of surface finishing processes for machined surfaces.

8. (a) Explain USM and AJM.

   (b) Explain Plasma machining. What are its applications?

_____ [2514/I/10]

[03 – 2211]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

ELECTRICAL TECHNOLOGY – II

(Effective from the admitted batch of 2006-2007)

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

(7 x 2 = 14)

1. (a) Define ASA system.

   (b) How are cutting forces of a tool are measured?

   (c) What are the operations which can be performed using a Shaper?

   (d) How is a milling machine is specified?

   (e) What is a machining centre?

   (f) Classify grinding wheels.

   (g) What are the limitations of LDM?

2. (a) While machining a mild steel bar with H.S.S tool the cutting speed is 32m/min. tool life is 50 mins, if cutting speed is increased by 50%, How tool life is affected? Take $n=0.2$. (8)

   (b) Explain Taylor's relationship for cutting speed-tool life. (6)

3. (a) Describe constructional features of speed gear box of machine tool. (5)

   (b) How do you specify an engine lathe? (5)

   (c) Explain about apron mechanism used in lathe. (4)

4. (a) Explain one mechanism of a shaper. (8)

   (b) Explain the various operations which can be performed on rolling machine (6)

5. (a) Explain with a neat sketch the construction and working principle of a radial drilling machine. (8)

   (b) What is broaching? Explain (6)

6. (a) Describe the dressing and balancing requirements in grinding. (8)
   (b) Explain Electro polishing and Buffing. (6)

7. (a) Explain the working principle of WJM process with its applications, advantages and disadvantages. (8)

(b) Explain the principle of photo chemical milling. (6)

8. Write short notes on the following :

(a) Broach time (4)
(b) Lapping, honing and super finishing (6)
(c) Grit and grade in grinding. (4)

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[03 – 2210]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

MATERIAL SCINECE

(Effective from the admitted batch of 2006-2007)

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Explain space lattice. (7 x 2 = 14)

   (b) What is lever rule?

   (c) Explain Burger's circuit.

   (d) What is martempering.

   (e) What are high alloy steels?

   (f) Explain Ductile to Brittle transition temperature.

   (g) What are the advantages of NDT.

2. (a) How are miller indices assigned to planes and directions of a crystal? (7)

   (b) Explain surface defects and line defects. (7)

3. (a) Draw Fe-Fe3C diagram and explain all the points, lines and areas. (7)

   (b) Describe hardening and tempering of steels. Explain the resulting structure and properties. (7)

4. (a) What are advantages and draw backs of alloy steels? (5)

   (b) Explain structure, properties and applications of stainless steels, Grey cast iron and malleable cast iron. (9)

5. (a) Describe surface hardening by cyaniding and induction hardening. (6)

   (b) Explain structure, properties and applications bronzes and bearing metals. (8)

6. (a) Explain mechanisms of fatigue and high temperature alloys. (8)

   (b) Compare ductile fracture with brittle fracture. (6)

7. (a) What is a composite and describe methods used for fabrication of composites. (5)

   (b) Explain metal matrix composites. Give examples and applications. (4)

   (c) What is the role of fibers and matrix in fiber reinforced composites?(5)

8. Briefly write on any THREE of the following NDT methods and their applications : (14)

(a) Dye penetraut test.

(b) Eddy current test

(c) Radio graphic inspection.

(d) Ultrasonic test.

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[03 – 2205]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

ENVIRONMENTAL STUDIES

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What is basic difference between Ecology and Ecosystem?

   (b) State the impacts of Mining activities on Environmental Quality.

   (c) What is Hot Spot? List the various Hot Spots of India.

   (d) What are sources of Marine pollution?

   (e) What are benefit Global Warming?

   (f) What is Cloud Seeding?

   (g) Mention the various sustainable life styles to achieve 'Sustainable Development'.

2. (a) Explain the scope and importance of "Environmental Studies".

   (b) Differentiate between Forest ecosystem and Aquatic ecosystem with reference to functions.

3. (a) What is difference between Land degradation and desertification? Explain the causes for over utilization of water resources.

   (b) Explain the various alternate energy sources.

4. (a) What is difference between Biodiversity and abundance of Species? Explain Ex-Situ conservation techniques of bio diversity.

   (b) Discuss the values of Biodiversity.

5. (a) Explain the causes and impacts of Noise pollution.

   (b) What is acid rain? Discuss the root causes and preventive measures of acid rain.

6. (a) What do you understand by term "Sanitation"? What are effects of Green revolution on Quality of Environment?

   (b) Discuss the problems of resettlement and rehabilitation due to major projects.

7. (a) What is EIA? Explain the objectives and components of EIA.

   (b) Explain the various Environmental Acts of India.

8. Write short notes on any THREE of the following:

   (a) Narmada Bacho Andolan

   (b) Fluoresis in Andhra Pradesh

   (c) Marine pollution

   (d) Desertification

   (e) Conflicts over water.

_____ [2514/I/10]

[03 – 2212]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

THEORY OF MACHINES - I

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Draw the Klein's diagram and indicate all the salient features.

   (b) Define limit position, dead center and transmission angle.

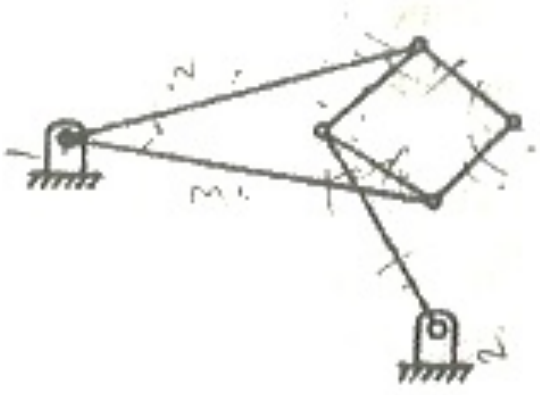
   (c) Two shafts are to be connected by a Hooke's joint. The driving shafts is rotated at a uniform Speed of 500 rpm and the speed of the driven shaft must be 475 and 525 rpm. Determine the maximum permissible angle between the shafts.

   (d) Explain precisely the uses of turning moment diagram of reciprocating engines.

   (e) The mass of fly wheel of an engine is 6.5 tonnes and the radius of gyration is 1.8 metres. It is found from the turning moment diagram that the fluctuation of energy is 56 KN.m. If the mean speed of the engine is 120 rpm, find the maximum and minimum speeds.

   (f) What is the difference between piston effort, crank effort and crank pin effort?

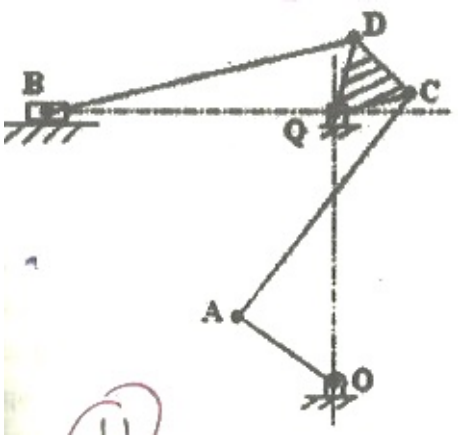
   (f) Determine the D.O.F for the following linkage.



2. Describe the working of a Hooke's joint with a neat sketch. Also prove that the ratio of angular velocity of the driven shaft to that of the driving shaft with a Hooke's joint is $\frac{\cos\propto}{1-sin^2 \propto \cos^2 \theta}$

   Where θ is the angle turned by the driving shaft at any instant and $\propto$ is the angle of inclination of driven shaft with driving shaft.

3. In the mechanism shown in Figure. The crank OA rotates at 50 rpm and the lengths of the links are OA = 125 mm, AC = 600 mm, QC = 150 mm, QD = 150 mm, CD = 130 mm, BD = 550 mm and OQ = 625 mm. When the angle AOQ = 45 degrees. Determine the linear acceleration of the slider at B.



4. (a) What is a friction circle? Derive an expression for its radius.

   (b) The thrust on the propeller shaft of a marine engine is taken up by 8 collars whose external and internal diameters are 660 mm and 420 mm respectively. The thrust pressure is 0.4 MN/mm^2 and may be assumed uniform. The coefficient of friction between the shaft and collars is 0.04. If the shaft rotates at 90 r.p.m. : find.

      (i) Total thrust on the collars : and

      (ii) Power absorbed by friction on the bearing.

5. In a porter governor, the arms and links are each 25 cms long and intersect on main axis. Each ball weights 3 kgf and the central load 27.25 kgf. The sleeve is in the lowest position when the arms are inclined at 27^0 with the axis. The lift of the sleeve is 5 cm. What is the force of the friction at the sleeve if the speed at the beginning of ascent at the lowest position is equal to the speed at the beginning of descent from the highest position?

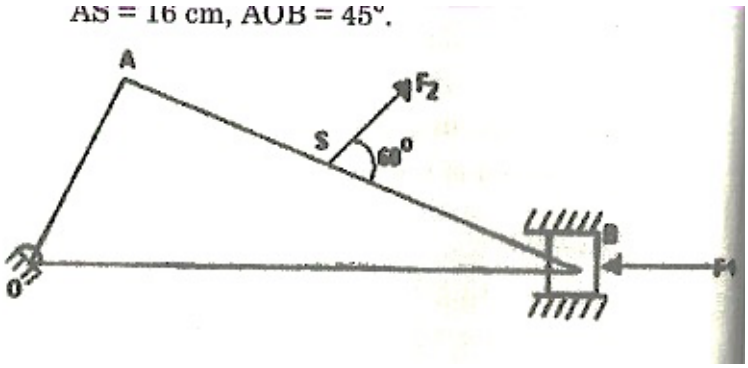
6. high speed engine has connecting rod length 5 times the crank which is 6 cm. It weights 30 N has a center of gravity 10 cm from the big end bearing. When suspended in bearing it makes 50 complete oscillations in 52 seconds. The reciprocating parts weight 15 N. Determine the torque exerted on the crank shaft due to the inertia of the moving parts when the crank makes an angle of 135 degrees with the top dead center when the speed of rotation is 1200 rpm.

7. (a) Derive the expression for the torque transmitting capacity of single plate clutch by considering uniform pressure.

   (b) A friction clutch is required to transmitted 34.5 kW at 2000 rpm. It is to be single plate disk type with both sides of the plate effective, the pressure is being applied axially by means of springs and limited to 70 kPa on the plate. If the outer diameter of the friction limit is 1.5 times the internal diameter, find the required dimensions d1 and d2 of the clutch ring and the total force exerted by the springs. Assume uniform wear condition (coefficient of friction = 0.3).

8. In the figure given below the slider crank mechanism, the forces F1 and F2 are known. Determine the torque that may be applied on the crank shaft to maintain equilibrium.

   F1 = 100 kgf, F2= 80 kgf, AB=36cm, OA=9 cm, AS=16 cm, AOB=45^0.



[2514/I/10]

[03 – 2205]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

INDUSTRAL ELECTRONCS AND MICROPROCESSORS

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Explain the types of semiconductors.

   (b) Write the different configurations of BJT.

   (c) What is the constituent party of an oscillator?

   (d) Write the applications of dielectric heating.

   (e) Convert $1234_{(10)}$ into Hexa decimal number.

   (f) State whether the following equally is correct or not :
   A+BC+AC = BC

   (g) What are the applications of memory devices?

PART B

2. (a) Draw the V-I characteristics of a Zener diode and explain its operation.

   (b) Explain the operations of NPN and PNP transistors with neat diagrams.

3. (a) Draw the circuit diagram of an halfwave rectifier and explain the operation.
   (b) Explain the different applications of CRO.

4. (a) What is meant by resistance welding" Explain.

   (b) Explain the working of a closed loop system briefly.

5. (a) Draw the block diagram of Electronic Timer and explain each block.

   (b) What are the basic rules and properties of Boolean Algebra?

6. (a) Explain the operations of D-flioflop and T-Flipflop with truth tables.

   (b) Define shift registers. Explain the different types of shift registers briefly.

7. (a) What are the different classifications of ROMS? Explain how data can

be written into a PROM.

(b) Explain the various functions of the registers in the 8085 programming model.

8. (a) List the steps to initiate and implement the 8085 interrupts.

(b) Explain the functions of data transfer instructions and how the contents of the source register and the destination register are affected.

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[03 – 2203]

II/IV B.E. DEGREE EXAMINATION.

SECOND SEMESTER - APRIL 2010

MECHANICAL ENGINEERING

ENGINEERING MECHANICS – II

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Define Law of Gravitation and Newton's third law.

(b) What is the difference between speed and velocity?

(c) Find the angle of banking for a highway curve 200 m radius designed to accommodate cars traveling at 120 kmph, if the coefficient of friction between tyres and the road is 0.6.

(d) Define direct impact and central impact

(e) Give the expression for time period of a compound pendulum.

(f) State D'Alemberts Principle.

(g) Give the expressions for Range and Time of Flight.

PART B

2. A block weighing 2500N rests on a level horizontal plane for which the coefficient of friction is 0.2 This block is pulled by a force of 1000N, which if acting at an angle of 30° to the horizontal. Find the velocity of the block, after it moves 30m, starting from rest. If the force of 1000N is then removed how much further will it move?

3. A train weighing 3000kN is moving up a slope 2 in 100 with an acceleration of 0.04m/sec^2. Tractive resistance is 6N/kN. Determine the acceleration of the train if it moves with the same tractive force:

(a) On a level track

(b) Down the plane inclined at 2 in 100.

4. (a) A flywheel rotating at 3 rev. per sec. has its speed increased at constant rate of 45 rev per mm. each second during an interval of 10 sec. Through how many revolutions does it rotate in this time?

(b) A particle moves on a circular path of 10m radius so that the arc distance from a fixed point on the path is given by $s = 4t^3-10t$ where s is in m and t is in seconds. Compute total acceleration at end of 2 seconds.

5. A bullet is fixed from a height of 120m at a velocity of 360 kmph at an angle of 30° upwards. Neglecting air resistance, find

(a) Total time of flight

(b) Horizontal range of the bullet

(c) Maximum height reached by the bullet, and

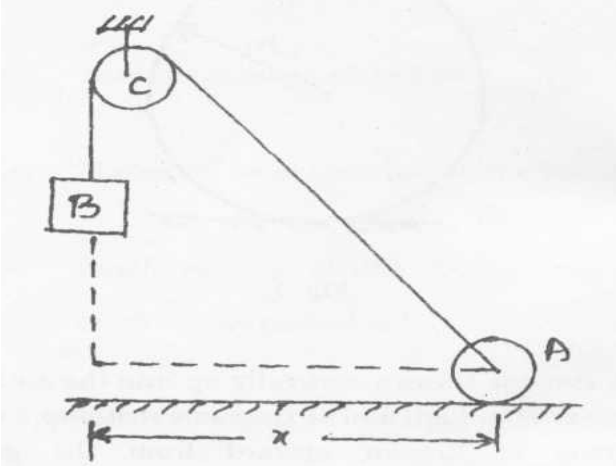
(d) Final velocity of the bullet just before touching the ground.

6. A particle of weight W, moving at a velocity of $l/2\sqrt{gr}$ m/s at the top, slides vertically along the surface of a smooth cylinder of radius r. The axis of cylinder is horizontal. Find the vertical distance the particles fall before it leaves the cylinder

Fig. 1.

7. A stone is thrown vertically up into the air from a tower 30m high and at the same instance a second stone is thrown upward from the ground. The initial velocity of the first stone is 15m/s and that of second stone is 22.5 m/s. When and where the stones be at the same height from the ground.

8. The rope of length L connects wheel A and , weight B by passing over a pulley of negligible size at C. At the instance when x = 9m, the centre of wheel A has a velocity of l0m/s and acceleration of 4m/S^2 both right ward. What is then the velocity and acceleration of B?



[2514/I/10]

[03 - 2207]

II/IV B.E. DEGREE EXAMINATION.
SECOND SEMESTER - APRIL 2010
MECHANICAL ENGINEERING
MATERIAL SCIENCE AND MATALLURGY

Time : Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Define planes and directions.
   (b) What are different point defects? Explain.
   (c) What is phase rule and give its uses.
   (d) Classify surface hardening methods.
   (e) What is the effect of W, Cr and Mn as alloying elements in steels?
   (f) What are low temperature metals? Give few examples.
   (g) Give the principle of Dye penetrant test.

PART B

2. (a) Explain different crystal systems. (6)
   (b) Draw a neat Fe-Fe3C phase diagram. Indicate all points, lines, and areas. With the help of this diagram explain the isothermal reactions existing in it. (8)
3. (a) Draw a neat I-T diagram for a cutecoid steel and explain it. Superimpose this diagram with cooling curves for annealing, normalising and rapid quenching. Give the resulting microstructures and corresponding hardness values. (8)
   (b) What is carburising? Explain pack carburizing and give its applications. (6)

4. (a) What are the uses and limitations of plaincarbon steels? (4)
   (b Write notes on tool steels and Hadfield manganese steels giving their composition, structure, properties and applications. (5)
   (c) Give composition, properties and applications of white cast iron and S.G. iron.
5. (a) What is the need for the development of non-ferrous alloys? Give the classification of non-ferrous alloys. (5)
   (b) What are cupronickels and monels? Give their applications. (4)
   (c) What are the outstanding properties of aluminium? Give some applications of Al-Si and Al-Cu alloys. (5)
6. (a) What is fracture? Discuss ductile and brittle fracture in detail. (6)
   (b) Explain Griffith's theory of brittle fracture. (8)
7. (a) What are the advantages of powder metallurgy over other manufacturing

give its applications. (8)

(b) Give classification and applications of composite materials. (6)

8. Write short note on any FOUR of the following :

(a) Edge and Screw dislocations

(b) Nitriding

(c) Cast irons Vs Steels

(d) Copper-base alloys

(e) High temperature alloys

(f) Radiography.

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[03 - 2205]

II/IV B.E. DEGREE EXAMINATION.
SECOND SEMESTER - APRIL 2010
MECHANICAL ENGINEERING
INDUSTRIAL ELECTRONICS AND
MICROPROCESSORS

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Explain the types of semiconductors.
   (b) Write the different configurations of BJT.
   (c) What are the constituent party of an oscillator?
   (d) Write the applications of dielectric heating.
   (e) Convert $1234_{(10)}$ into Hexa decimal number.
   (f) State whether the following equality is correct or not:

   A+BC+AC=BC.

   (g) What are the applications of memory devices?

PART B

2. (a) Draw the V-I characteristics of a Zener diode and explain its operation.
   (b) Explain the operations of NPN and PNP transistors with neat diagrams.
3. (a) Draw the circuit diagram of an halfwave rectifier and explain the operation.
   (b) Explain the different applications of CRO.
4. (a) What is meant by resistance welding? Explain.
   (b) Explain the working of a closed loop system briefly.
5. (a) Draw the block diagram of Electronic Timer and explain each block.
   (b) What are the basic rules and properties of Boolean Algebra?
6. (a) Explain the operations of D-flioflop and T-Flipflop with truth tables.
   (b) Define shift registers. Explain the different types of shift registers briefly.
7. (a) What are the different classifications of ROMS? Explain how data can be written into a PROM.
   (b) Explain the various functions of the registers in the 8085 programming model.
8. (a) List the steps to initiate and implement the 8085 interrupts.
   (b) Explain the functions of data transfer instructions and how the contents of the source register and the destination register are affected.

[03 - 2202]

II/IV B.E. DEGREE EXAMINATION.
SECOND SEMESTER - APRIL 2010
MECHANICAL ENGINEERING
METALLURGY

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A (7 x 2 = 14)

1. (a) Explain eutectic and eutectoid reactions.
   (b) Why steels are subjected to tempering after hardening?
   (c) What is martensile? Why is it so hard?
   (d) What are bronzes? Give one example with applications.
   (e) What is CRSS? Explain.
   (f) Define Creep and Fatigue.
   (g) Give the principle and applications of dye penetrant test.

PART B

2. (a) Explain general characteristics of Solid solutions. (3)
   (b) What are point defects? Explain them. (5)
   (c) Explain with neat sketches
      (i) edge and
      (ii) screw' dislocations. (6)
3. (a) Draw a neat sketch of Fe - Fe_3C diagram and label it. (4)
   (b) Briefly explain different heat treatment employed for steels giving their purposes. (5)
   (c) Give the purpose, advantages and applications of various surface hardening methods. (5)
4. (a) What is high speed steel? Give the typical composition of high speed tool steel. Explain the role of each alloying element in tool steels. Also explain the heat treatment of high speed steel. (8)
   (b) Write short note on stainless steels and managing steels. (6)

5. (a) Write short note on the following :
      (i) Cupronickels
      (ii) Brasses
      (iii) Babbits
      (iv) Monels. (10)
   (b) Explain cast aluminium alloys briefly. (4)
6. (a) Differentiate between ductile and brittle fractures. (4)
   (b) Write an account on high temperature alloys and their applications. (5)
   (c) What are advantages and limitations of powder metallurgy? (5)
7. (a) Explain the terms : Matrix, Reinforcement and interface. Write their respective roles. (3)
   (b) List out various fabrication methods used for composite materials. (5)
   (c) Describe magnaflux method and give its advantages and limitations. (6)
8. Write short note on any FOUR of the following :

(a) I-T curves
(b) Martempering
(c) Hadfield manganese steel
(d) Giffith's theory
(e) Radiography
(f) Metal Matrix composites (MMCs)

_____ [2514/I/10]

[03 – 2201]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2012
MECHANICAL ENGINEERING
MATHEMATICS - IV

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Show that the function $f(z)=xy+iy$ is continuous everywhere but not analytic anywhere

(b) Evaluate $\int_c e^z\, dz$ where $C : |z|=1$

(c) Define the terms :

(i) Zero of an analytical function

(ii) Singular points.

(d) State three main characteristics of normal distribution.

(e) Two bolts are drawn from a box containing 4 good and 6 bad bolts. Find the probablity that the second bolt is good if the first one is found to be bad.

(f) In eight throws of a die 5 or 6 is considered a success. Find the mean number of success and the standard deviation.

(g) Prove that $Z\left\{\frac{1}{n!}\right\} = e^{1/z}$

PART B

2. (a) Find the analytic function $f(z)=u+iv$ given that $2u+ v = e^{2x}((2x+y)\cos 2y+(x-2_i y)\sin 2y)$.

(b) If $f(z) = u+iv$ is analytic prove that

$\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right] \log |f'(z)| =0$

3. (a) Expand $1/(z^2-3z+2)$ when $1< |z| <2$ by Laurent's series.

(b) Evaluate $\int_c \frac{e^{2z}}{z^2+1} dz$ where $|z| =1/2$ by using Cauchy's integral formula.

4. (a).Find residue of $f(z)= \frac{z^2-2z}{(z+1)^2(z^2+4)}$ at each of its poles.

(b). Prove that $\int_0^\infty \frac{dx}{(x^2+1)^2} = \frac{\pi}{4}$

5. (a)

Samples of students were drawn from two universities and from their weights in kiograms, mean and standard deviations are calculated and shown below. Make a large sample test to test the significance of the difference between the means.

	Mean	SD	Size of the sample
University A	55	10	400
University B	57	15	100

(b) A Sample of 26 bulbs gives a mean life of 990 hours with a S.D. of 20 hours. The manufacturer claims that the mean life of bulbs, is 1000 hours. Is the sample not up to the standard?

6. (a) On the basis of information given below aboutthe treatment of 200 patients suffering from a desease, state whether the new treatment is comparatively superior to the conventional treatment.

[03 - 2210]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2012
MECHANICAL ENGINEERING
MATERIAL SCIENCE

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Define space lattice and unit cell.
   (b) Define Gibb's Phase rule.
   (c) What is the ratio of number of atoms per square mm in Simple cubic structure for the plane (110)?
   (d) Distinguish between the hardness and hardenability of a steel.
   (e) What are the ingredients of various FRP?
   (f) Define Tempering.
   (g) What are the bearing materials?
2. (a) Briefly explain the importance of material science in the field of engineering.
   (b) Show that the ratio of C/a ratio for an ideal H.C.P structure is 1.633.
3. (a) Differentiate between ductile and brittle fractures.
   (b) Write an account on high temperature alloys and their applications.
4. (a) Compare the properties of plain carbon steels with those of alloy steels.
   (b) Explain AISI-SAE classification of steels.
5. Distinguish between the following:
   (a) Carburizing and Nitriding
   (b) Annealing and Normalizing
6. Write short notes on :
   (a) Isothermal transformation curves,
   (b) Point defects
   (c) Ultrasonic test.
7. (a) Justify
      (i) Fe Fe_3C equilibrium diagram is not a true equilibrium diagram
      (ii) Stress required to initiate slip is ore than that required to continue.
   (b) Explain Magnetoresticton.

(a) Explain applications of particulate composites.
   (b) Discuss any one method of manufacturing fiber composites.

[05 – 2205]

II/IV B.E./B.Tech. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2012

MECHANICAL ENGINEERING

ENVIRONMENTAL STUDIES

Time: Three hours Maximum: 70 marks

Answer Question No. 1 and choose FOUR from other Seven questions.

1. (a) What are biotic and abiotic components in an ecosystem?
   (b) Mention Renewable and Non-Renewable Energy sources.
   (c) What do you understand by term "Value of biodiversity?
   (d) What is meant by Ozone depletion?
   (e) State practical benefits watershed Management.
   (f) What are advantages of EIA?
   (g) State environmental impacts of Nuclear reactor.
2. (a) What is Grass Land ecosystems? Compare the forest ecosystem with Aquatic ecosystem?
   (b) What is difference between soil erosion and desertification?
3. (a) Explain the causes and Impacts of
      (i) Floods
      (ii) Droughts.
   (b) What are alternative energy sources? State their merits and demerits?
4. (a) Indian is a mega diversity habitate. Justify this statement with reasons.
   (b) Explain causes, effects and control measures of water pollution.
5. (a) What is Acid Rain? State its causes and Implications on Environmental Quality?
   (b) What is urbanisation? Mention the advantages and disadvantages of Industrialization.
6. (a) What is meant by Ground Water depletion? Discuss the status of water scarcity in India.
   (b) What is difference between environment development and economic development? Explain how economic development threats environment development.
7. (a) Discuss the typical features of water pollution (prevention and control Act).
   (b) What is Ralegaon Siddlii? Explain the role of Ann Hazaire for development of Ralegaon Siddhi.
8. Write short notes :
   (a) Conflicts over water
   (b) Effect of modern Agriculture
   (c) Soil pollution
   (d) Sustainable development
   (e) Fluorosis.

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[2537/2/1/12]

[03 – 2211]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2012
MECHANICAL ENGINEERING
ELECTRICAL TECHNOLOGY

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) State Faraday Laws of Electromagnetic Induction.
   (b) Write the EMF equation of DC Generator and explain various terms involved.
   (c) Define the term Armature fraction in D.C. Machines.
   (d) Draw the no load phasor diagram of a 1Ø transformer.
   (e) Draw slip/torque characteristics of a 3Ø induction motor.
   (f) Why a synchronous motor is not a self starting motor?
   (g) What is a potentiometer?
2. (a) Define magnetomotive force and flux density.
   (b) A straight conductor 1.5 m long carries a current of 40 A. It is lying at right angles to an uniform magnetic field of flux density 0.8 T. Find
      (i) The mechanical force developed in the conductor.
      (ii) The power required to drive the conductor at a uniform speed of 25 m/s and
      (iii)The emf induced in the conductor.
3. (a) Explain the conditions required for the build up of emf of a self excited D.C. shunt generator.
   (b) A 4 pole d.c. shunt generator is delivering 20 A to a load of 10 ohms. The armature resistance is 0.5 ohms and shunt field resistance is 50 ohms. calculate the induced emf and the efficiency of the machine.
4. (a) What are the various losses in a DC machine? How do they vary with load?
   (b) A 500 V shunt motor takes 4 A on no load. The armature resistance including that of the brushes is 0.2 ohms. The field current is 1 A. Estimate the efficiency when the input current is 100A.
5. (a) Describe the tests to be performed with circuit diagrams to estimate efficiency of a 1ø transformer
   (b) A 7.5 KVA, 1ø transformer with a voltage ratio of 500/250 volts has primary resistance of 0.2 ohms and leakage reactance of 0.6 ohms. The

corresponding values for the 0 O 1 0 secondary side are 0.05 ohms and 0.15 ohms. Find the terminal voltage at full load on secondary at 0.8 pf lagging.

6. (a) Explain how a rotating magnetic field is produced in a 3ø induction motor.

(b) The power input to the rotor of a 440 V, 50 Hz, 6 pole, 3ø induction motor is 60 kW. The rotor emf frequency is 90 cycles/minute. Calculate the slip, rotor speed, rotor copper loss, mechanical power developed and rotor resistance/phase if the rotor current is 60 A.

7. (a) A 100 kV, 3000 V, 50 Hz, 3ø, star connected alternator has an armature resistance of 0.2 ohms. A field current of 40 A produces a short circuit current of 200 A and an open circuit line to line voltage of 1040 V. Calculate the full load percentage regulation at 0.8 pf lagging and leading.

(b) What are different methods used for starting synchronous motor? Explain them.

8. Write short notes :

(a) Moving coil voltmeter

(b) Megger

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[03-2204]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2012
MECHANICAL ENGINEERING
ELECTRICAL TECHNOLOGY

Time: Three hours Maximum : 70 Marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Define reluctance, magnetic flux and magnetomotive force. State the relation among them.

   (b) Write the e.m.f. equation of a D.C. generator. What is armature reaction in D.C. machine?

   (c) What is the condition for maximum efficiency to occur in a D.C. series motor?

   (d) Give the expression for power in a 3-phase system in line values and phase values.

   (e) Define the term "voltage regulation" with respect to transformer. Can it be zero? If so, when?

   (f) Give the power flow diagram for 3-phase induction motor.

   (g) Show that synchronous motor is not a self starting motor.

PART B

2. (a) Explain with suitable diagrams and expressions, the following :
   (i) Dynamically induced e.m.f.
   (ii) Statically induced e.m.f.
   (iii)Mutually induced e.m.f.

   (b) An iron ring of cross-sectional area of 10 cm^2 is wound with a wire of 1500 turns has saw cut of 3 mm gap. Calculate the magnetizing current required to produce a flux of 0.25 mwb if mean length of the magnetic path is 50 cm and relative permeability of 470 and the leakage factor is 1.2.

3. (a) Explain how a D.C. shunt generator builds up the voltage.

   (b) A 250 volts, 4 pole, wave wound d.c. series motor has 782 conductors on the armature. It has armature and series field resistance oi 0.75 ohm. the motor takes a current of 40 Amps from the supply. Estimate its speed and gross torque developed if it has a flux per pole of 25 mwb.

4. (a) Define (i) inductive reactance (ii) Capacitive reactance (iii) impedance and (iv) admittance with respect to an a.c. circuit.

   (b) Three coils each having a resistance of 60 ohms and reactance of 80 ohms are connected in star to a 440 volts, 3-phase, 50 Hz supply. Calculate the line currents and the power supplied.

5. (a) Derive an expression for the induced e.m.f. for a single-phase transformer.

   (b) A 40 KVA, 1-phase, 2000/250 volts transformer has a primary resistance of 1.15 ohms and a secondary resistance of 0.0155 ohms. Calculate (i) the total resistance in terms of the secondary winding (ie. when primary is referred to secondary) (ii) the total resistance drop on full load and (iii) the total copper loss on full load.

6. (a) Derive the torque equation of a 3-phase induction motor.

   (b) A 6-pole, 50 Hz, 3-phase squirrel cage induction motor runs on load at a shaft speed of 970 r.p.m. Calculate (i) the slip and (ii) the frequency of the induced current in the rotor.

7. (a) Explain the synchronous impedance method of calculating the voltage regulation of an alternator.

   (b) Name the various methods of starting synchronous motor and explain one method in detail.

8. (a) Describe the construction and explain the principle of operation to measure current in an a.c. circuit.

   (b) Explain with the help of a neat sketch, the principle of operation of a single-phase energy meter

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[03-2212]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2012

MECHANICAL ENGINEERING

THEORY OF MECHANICS — I

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Draw slider crank chain and double slider crank chain.
   (b) List the kinds of friction.
   (c) Explain Corriolis component of acceleration.
   (d) What is the function of a flywheel?
   (e) Define machine and mechanism.
   (f) What do you understand by instantaneous center of a link?
   (g) State D'Alembert's principle.
2. (a) Classify kinematic pairs. Explain with neat sketches.

   (b) Let OR be the diameter of a circle and Q a point on the circumference of the circle. Join O to Q and let P be a point on OQ produced. Show that, If OQ turns about O as center and the product OQ, OP remains constant, the point P will move along a straight line perpendicular to the diameter OR.
3. (a) Explain clearly how inertia torque on the crank shaft of a reciprocating engine mechanism be calculated.

   (b) A vertical steam engine has a bore of 15 cm and stroke of 30 cm. The connecting rod is 52.5 cm long and the reciprocating parts weigh 1200 N and the engine is running at 240 rpm. When the crank is 60 degrees past its top dead centre, the steam pressure on the cover side of the piston is 60 N/cm^2 while that on the crank side is 10 N/cm^2. Neglecting the area of the piston rod determine net force on the piston rod and the turning moment of the crank shaft.

4. (a) Sketch and explain proell governor.

   (b) A Hartnell Governor has equal balls of mass 3 kgs of initially at a radius of 200 mm. The arms of the bell crank lever are 110 mm vertically and 150 mm horizontally. Find the initial compressive force on the spring if the speed for an initial ball radius of 200 mm is 240 rpm and the stiffness of the spring required to permit a step up movement of mm on fluctuation of $7\frac{1}{2}$ percent in the engine speed.

5. (a) In a link *AB; A* is constrained to move horizontally with an acceleration of α, and the link itself moves with an angular velocity of W and angular acceleration α clockwise explain how the acceleration of the end *B* is calculated.

   (b) Explain how the velocity and acceleration in a slotted lever quick return mechanism are determined by relative velocity method with an example.

6. (a) Sketch the four bar chain and locate all the instantaneous centers.

   (b) The stroke of an engine is 15 cm and the connecting rod is 30 cm in length. Determine the velocity and acceleration of the piston when the crank has made 50 degrees measured from the inner dead centre and rotate at 600 rpm.

7. Explain clearly sensitiveness; isochronism; stability and controlling force with respect to governors.
8. Write notes on Kennedy's theorem, Klein's construction and dynamic analysis of slider crank mechanism.

_____ [2537/2/1/12]

[03 - 2213]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2012

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY - II

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) How are cutting forces measured?

   (b) What is cutting speed in lathe?

   (c) What is simple indexing?

   (d) Differentiate drilling from boring

   (e) List the different types of taper turning methods in lathe.

   (f) State the limitations of broaching.

   (g) What is the main function of a lathe.

2. (a) What are the merits and demerits of turret lathe over capstan lathe.

   (b) Explain clearly with neat sketches the different operations on a lathe.

3. (a) Explain different types of chips formed during metal cutting process.

   (b) Sketch a cutting tool of single point and * indicate its geometric features.

4. Explain the working of EDM, AJM and LBM with applications.

5. (a) Sketch and explain quick return mechanism used in shaper.

   (b) Explain clearly buffing operation.

6. (a) Sketch and explain cylindrical grinding machine with merits and demerits.

   (b) Sketch a typical one pass internal broach and indicate important broach teeth geometry.

7. (a) Describe the principle of lapping. Using diagrams show how it is applied to the machine lapping of external cylindrical surfaces.

   (b) Describe different grinding machines.

8. Classify drilling machines indicating the features and operation of each.

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[2537/2/1/12]

[03 - 2206]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2012
MECHANICAL ENGINEERING
MANUFACTURING TECHNOLOGY — II

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Indicate the limitations of broaching.
   (b) State the main function of a lathe.
   (c) Define indexing on milling machine.
   (d) Define mechinability.
   (e) What do you mean by grit and grade in grinding?
   (f) Why cutting forces are measured?
   (g) How the size of a drilling machine is specified?

PART B

2. (a) Discuss in detail the bonding processes and classification of grinding machines.
   (b) Make a critical note on ATM and ECG.
3. (a) Discuss the general safety precautions on machines.
   (b) What are the materials commonly used for making a tool in ECM? List ECM applications.
4. (a) Distinguish between wet and dry grinding.
   (b) Discuss the effect of friction and temperature in metal cutting.
5. Explain theory of Ernest and Merchant; nomenclature of cutting tools and lapping.
6. (a) Explain the method of turning screw threads on a lathe.
   (b) Explain the mechanism used to vary the stroke of the ram in a shaper.
7. Differentiate between a capstan; a turret and a lathe.
8. (a) Derive the expression of chip reduction coefficient in single point cutting. State the assumptions used.
   (b) Obtain the indexing for 87 divisions

_____ [2537/2/1/12]

[03 - 2203]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2012
MECHANICAL ENGINEERING
ENGINEERING MECHANICS - II

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Define dynamics and displacement.
   (b) What is the advantages of work energy theorem?
   (c) What is central direct impact?
   (d) Explain time of flight and range w.r.t projectile.
   (e) What is a torsional pendulum?
   (f) State the principle of angular momentum in plane motion.
   (g) Explain relative velocity and absolute velocity.
2. (a) Derive equations of rectilinear motion of a particle acted upon by a constant force.
   (b) A mine cage of weight 8.9 kN starts of from rest and move down ward with constant acceleration traveling a distance of 30 min 10 sec. Find the tensile force in the cable during this time.
3. (a) A particle initially at rest is submitted to the action of a force $X=Rt$. Prove that the ratio x/x increases as a linear function of time.
   (b) State and explain D' Alembert's principle with an example.
4. A Morton fires a projectile across a level field so that the range is maximum and equal to 900 m. Find the time of flight. Derive the formulae used if any.

5. (a) The motion of a particle of mass m in the *xy* plane is defined by the equations $x = a$ cos pt; y-usin2 *pt*; where a, b and p are constants. Calculate the moment of momentum of the particle w.r.t the origin.

   (b) State and explain work-energy theorem with an example.

6. (a) Derive the expression for the equivalent length of the compound pendulum treated a simple pendulum.

   (b) Owing to cooling, the linear dimension of a solid homogeneous sphere, uniformly rotating about a diameter, diminish by 0.1 percent. What effect will this have on the angular velocity if there is no external moment w.r.t. the diameter of the sphere?

7. (a) Draw a four link mechanism of your choice and locate all the instantaneous centres.

   (b) A solid circular cylinder and a sphere are started from rest at the top of an inclimed plane at the same time and both role with out sliding, down the plane. If when the sphere reaches the bottom of the incline, the cylinder is 3.6 m behind it, what is the total length of the incline?

8. (a) Explain coriolis acceleration and desire an expression for its magnitude.
   (b) Explain clearly the kinematics of relative motio

[03 - 2205]

II/IV B E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2012
MECHANICAL ENGINEERING
INDUSTRIAL ELECTRONICS AND MICROPROCESSORS

Time: Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. Answer the following.
   (a) Define RMS ON state current of an SCR.
   (b) Explain di/dt rating of SCR.
   (c) Define thermal runaway.
   (d) Define RMS current referred to FWR circuit.
   (e) Define ripple factor referred to FWR circuit.
   (f) Define Set up time.
   (g) What is a programme counter?

PART B

2. (a) Explain the operation of a SCR using its characteristics.
   (b) Explain about the regulation characteristics of Zener diode with a circuit and waveforms
3. (a) Explain the principle of operation of HWR and draw the waveforms.
   (b) Classify different type of oscillators based on frequency range. Why RC oscillators are not suitable for high frequency applications?
4. (a) Explain the poly-phase resistance welding circuit.
   (b) List and explain the applications of induction heating.
5. Explain about the following.
   (a) Closed loop servo-mechanism
   (b) Photo electric circuits
6. (a) Draw the circuit diagram of J.K flip flop with NAND gates with positive edge triggering and explain its operation with the help of truth table. How race around condition is eliminated.
   (b) (i) Convert the decimal number 96 into binary and convert it to gray code number.
   (ii) Convert the given gray code number to binary: 1001001011.
7. (a) Explain about ROM and PROM memories.
   (b) Explain the architecture of 8085 microprocessor.
8. (a) Explain about the databus, address bus and control bus of 8085.
   (b) Explain different interrupts present in 8085 microprocessor.

II/IV B.E. DEGREE EXAMINATION.
SECOND SEMESTER - APRIL 2013
MECHANICAL ENGINEERING
MATHEMATICS — IV

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Write down the continuity concept of $f(z)$.

(b) Explain the singularity of $e^{1/z}$.

(c) Evaluate $c\int_c |z - a|\, dz$ where C: $|z - a| = 1$.

(d) Define level of significance.

(e) State two properties of Student's t-distribution.

(f) *Solve :* $2y_{n+2} - 3y_{n+1} + 2y_n = 0$.

(g) Find z-transform of $u(n-1)$.

PART B

2. (a) If $f(z) = u + iv$ is an analytic function of z, find $f(z)$ if $u + v = 2x(1 - y)$.

(b) If $f(z)$ is a regular function of z, prove that

$$\left(\frac{d\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2.$$

3. (a) Consider the region bounded by x=1, y=1 and $x+y$ =1. Determine the region of the w-Plane under the transformation $w=z^2$.

(b) Verify caushy's theorem for the function $f(z) = z^2+3z-2i$ if C is the circle $|(z)|=1$.

4. (a) Find the Laurent series for $\frac{e^{2z}}{(z-1)^3}$ about z =1.

(b) Prove that $\int_0^{2\pi} \frac{4\,d\theta}{5+4\sin\theta} = \frac{8\pi}{3}$, using the theory of residues.

5. (a) Determine a 95% confidence interval for the variance of the samples 325, 320, 328 and 330 taken from a normal population.

(b) A manufacturer claims that only 4% of his products supplied by him are defective. A random sample of 600 products contained 36 defectives. Test the claim of the manufacturer.

6. (a) The number of accidents in a street during a particular week is given below :

Days:	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents :	5	4	2	7	6	5

Test the hypothesis that the number of accidents does not depend on the condition of the road. [Given $x^2_{5,0.95} = 1.14$]

(b) A certain stimulus administered to each of 12 patients resulted in the following increases of blood pressure : 5, 2, 8, —1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will in general be accompanied by an increase in blood pressure?

7. (a) Solve : $y_{n+2} - 4y_n = n^2 + n - 1$.

(b) Solve : $2y_{n+2} + 3y_{n+1} + y_n = \sin 2n$.

8. **(a)** If $X(z) = \frac{z^2+}{(z+1)^3}\frac{6z+5}{}$ find the value of x(1) and x(2).

(b) Solve the following using z-transform $y_{n+2} - 9y_n = 2n + 1$ with y(0) = l, y(l) = 0.

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[2546/1/I/13]

[03 - 2210]

II/IV B.E. DEGREE EXAMINATION.

SECOND SEMESTER - APRIL 2013

MECHANICAL ENGINEERING

MATERIAL SCIENCE

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Define Slip system.
   (b) Define Hall effect.
   (c) What is edge and screw dislocation?
   (d) What is Single crystal?
   (e) Define Fick's law of diffusion
   (f) What is the mechanism behind photoconduction?
   (g) What is carburizing?
2. (a) Briefly explain the importance of material science in the field of engineering.
   (b) Show that the c/a ratio for an ideal HCP structure is 1.633.
3. (a) Explain hardening and tempering.
   (b) Discuss the cooling behaviour of 0.5% C and 2.5% C alloys with help of Fe-Fe_3C equilibrium diagram.
4. (a) Discuss the Austempering treatment and their applications.
   (b) Explain isothermal transformations curves.
5. (a) Draw a brief account on classification of steels.
   (b) What are the uses and limitations of plain carbon steels?
6. (a) Why is it necessary to control atmosphere during sintering?
   (b) Describe the important applications of powder metallurgy.
7. Discuss the importance of composite materials giving their classification and applications.
8. Explain :
   (a) Ultrasonic method of testing
   (b) Fabrication of composite materials
   (c) Crystal defects

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[2546/1/I/13]

[05 - 2205]

II/IV B.E. DEGREE EXAMINATION.

SECOND SEMESTER - APRIL 2013

MECHANICAL ENGINEERING

ENVIRONMENTAL STUDIES

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Give the objectives of environmental studies.
   (b) Define Ecosystem.
   (c) What are Hot Spots?
   (d) What do you understand about Global Warming?
   (e) What is green revolution?
   (f) What is sustainable development?
   (g) What is Environmental Impact Assessment?
2. (a) Give an account of different types of ecosystems and mention their characteristic features.
   (b) Give the methods of controlling soil erosion.
3. (a) Write about the classification of natural resources.
   (b) Explain the effects of modern agriculture on land resources.
4. (a) Give an account of the causes and hazards of deforestation.
   (b) Write about the forest conservation and management.
5. (a) Give the biodiversity at local, national and global levels.
   (b) Give an account of the biodiversity conservation in India.
6. (a) Write about the impact of population explosion on environmental quality.
   (b) Give the methods of control of air pollution.
7. (a) Give an account of rain water harvesting and water shed management.
   (b) Explain the issues involved in enforcement of environmental legislation.

8. Write short notes on :
   (a) Non-Renewable energy resources.
   (b) Noise Pollution.
   (c) Nuclear Hazards

[03 - 2204]

II/IV B.E. DEGREE EXAMINATION.

SECOND SEMESTER - APRIL 2013

MECHANICAL ENGINEERING

ELECTRICAL TECHNOLOGY

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Define the terms 'Reluctance', 'm.m.f.' in terms of magnetic circuit.
   (b) What is excitation in a d.c. generator and classify it?
   (c) What is armature reaction in a d.c. machine?
   (d) Define 'Regulation' of a Transformer.
   (e) What is 'ship' in an induction motor?
   (f) Define the term "synchronous impedance" of a synchronous generator (Alternator).
   (g) How the ranges of voltmeters and ammeters can be extended? (7 x 2 = 14)

PART B

2. (a) Define the terms "self inductance", "mutual inductance" and "coefficient of coupling". Derive the relationship between these terms.
   (b) An Iron ring has a mean circumference of 12 cms and a cross sectional area of 10 cm^2. It is wound with a coil of 5000 turns. Find the value of current required to produce a flux of 4 milliwebers. Let the permeability of Iron be 200. (8)
3. (a) Derive the e.m.f. equation of D.C. generator. (6)
   (b) shunt generator has an induced e.m.f. on open circuit of 130 volts. When supplying load, the terminal voltage drops to 120 volts. The armature resistance and field resistance values are 0.02 ohm and 20 ohms respectively. Find the load current value. (8)
4. (a) Derive the expression for the torque developed in a D.C. motor. (6)
   (b) A 230 volts, D.C. motor takes full load armature current of 200 amps at 1750 rpm. The armature resistance is 0.2 drm. If the rotational losses are 1400 watts, determine the output torque. (8)
5. (a) Explain resonance phenomenon in a.c. circuits.
   (b) An inductive circuit supplied with 100 volts at 40 Hz is found to take 10 Amps and when supplied with 100 volts at 200 Hz, it takes 2 Amps. Determine the circuit constants assuming sinusoidal current.
6. (a) Draw and explain the phasor diagram of a single-phase transformer operating under no load condition.
   (b) A 5 KVA, 400/200 volts, 50 Hz, 1—phase transformer gave the following test results :
   No-load: 200V 2A 50W (L.V. side)
   S.C. test: 12V 10A 40W (H.V. side)
   Calculate the efficiency of the transformer when it delivers half full load at 0.8 p.f. lagging.
7. (a) Explain in details the methods of speed control of 3 –Phase induction motor

(b) A 3 –phase, 4—V, 4 –pole, 50 Hz induction motor develops 20 HP at 1425 rpm with a power factor of 0.8. The mechanical losses amount to 0.75 Hydraulic Particulars. Determine (i) rotor copper losses (ii) Gross torque developed in watts and (iii) the line current. Assume the stator losses be 1,000 watts.

8. (a) Derive an expression for the terminal voltage of a synchronous machine interms of frequency flux per pole and the number of conductors, discussing the assumptions that are made.

(b) With relevant diagrams, explain the constructions and working of dynamometer type of moving coil instrument.

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[2546/1/I/13]

[03- 2211]

II/IV B.E. DEGREE EXAMINATION.
SECOND SEMESTER - APRIL 2013
MECHANICAL ENGINEERING
ELECTRICAL TECHNOLOGY

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) On what factors hysteresis loss in dependent.
   (b) Define mutual inductance.
   (c) Give the application of DC series generator.
   (d) What are the limitations of Direct Load test on DC Motor?
   (e) What is the nature of an unbalance 3-phase circuit?
   (f) Explain the purpose of Megger.
   (g) What are the various types of Wattmeter?
2. (a) Explain the difference between statically induced emf and dynamically induced emf.
   (b) A current of 10 A through a coil of 200 tones produces a flux of 2 mwb. If this current is reduced to 2A in 0.1 sec., calculate the average emf reduced in the coil. Assume flux to be proportional to unit.
3. (a) Explain the significance of back emf in DC generator.
   (b) A series generator delivers a count of 100 A of 250 V. Its armature and series field resistances of 0.1 Q and 0.55 Q. Find the emf generated in the armature.
4. (a) Explain how the speed of on DC series motor in controlled.
   (b) Determine the value of torque in V-M established by armature of a 4-pole motor having 750 conducter two paths in parallel, 20 mwb per pole when the total armature current in 60 A.
5. (a) Develop the current 10 cm of an R-L-C series circuit excited by a sinusoidal a.c. supply.
   (b) Explain how the maximum efficiency of a transformer can be predicted from the results of OC and SC tests.
6. (a) Explain the various power stages of an Induction motor.
   (b) A 3-phase, 6-pole, 50 Hz induction motor has a slip of 1% at No load and 30% at Full load.
   Find :
   Full load speed
   Frequency of rotor current at full load.
7. (a) Explain the available methods of starting an synchronous motor.
   (b) For a 3-phase winding with 4 slots/pole/phase and with the coil span of 10 slots pitch. Calculate the values of the pitch factor and distribution factor.
8. (a) Explain how the power consumed in a circuit can be measured.
   (b) Explain the working of potentiometer.

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[2546/1/I/13]

[03- 2212]

II/IV B.E. DEGREE EXAMINATION.

SECOND SEMESTER - APRIL 2013

MECHANICAL ENGINEERING

THEORY OF MACHINES – I

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) Differentiate machine and structure

   (b) Define angle of friction and angle of repose.

   (c) What are the limitations of Scott Russell mechanism?

   (d) Explain Grashof s law.

   (e) What is wedge and where is it used?

   (f) Define fixed centrode and moving centrode

   (g) Explain dynamically equivalent system.

2. What is pantograph? Show that it generates a path similar to the path traced by a point on the mechanism.

3. (a) State and prove Arnold Kennedy's theorem of instantaneous centers.

   (b) A reciprocating engine has connecting rod of length 20 cm and crank 5 cm long. By Klein's construction determine the velocity and acceleration of piston when the crank has turned through an angle of 45 degrees from IDC clockwise and is rotating at 240 rpm.

4. (a) Define Kinematic pair. What is the difference between lower pair and higher pair? Give examples for each type.

   (b) Describe the three inversions of Double slider crank chain with neat sketches.

5. (a) Explain the construction and working of Davis steering gear with a neat sketch.

   (b) A Hooke's joint is used to connect two shafts whose axes are inclined at 20°. The driving shaft rotates uniformly at 6,000 rpm. What are the extreme angular velocities of the driven shaft? Find the maximum value of retardation or acceleration and state the angle where both will occur.

6. (a) A load of 10 kN is raised by means of a screw jack, having a screw threaded screw' of 12 mm pitch and of diameter 50 mm. If a force of 100 N is applied at the end of a lever to raise the load, what should be the given length of the lever used? Take coefficient of friction = 0.15. What should be the mechanical advantage obtained? State whether the screw is self locking.

7. A single cylinder four stroke cycle engine develops 15 kW Power at 330 rpm. The maximum fluctuation of energy is 80% of the indicated energy per cycle .The engine is connected through a gearing to a machine having a speed of 726 rpm. The moment of inertia of rotating parts of the engine is 104 kg-m^2 and that of the machine is 9.5 kgm^2. Determine the weight of additional flyw'heel that will be required to keep the overall range of speed variation to 0.75% of mean speed. Radius of gyration of the flywheel is 0.45 m.

8. In a Porter governor, the arms and links are each 25 cms long and intersect on the main axis. Each ball weighs 4 kgf and the central load is 20 kgf. The sleeve is in its lowest position when the arms are inclined at 300 to the axis. The lift of the sleeve is 5 cm. What is the force of friction at the sleeve?

II/IV B.E. DEGREE EXAMINATION.
SECOND SEMESTER - APRIL 2013
MECHANICAL ENGINEERING
MANUFACTURING TECHNOLOGY - II

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

1. (a) What are various types of chips?

   (b) What are the cutting forces in lathe?

   (c) Differentiate shaper and planer.

   (d) Explain machinability of cutting tools.

   (e) What do you understand by milling centre?

   (f) State the factors that affect tool life.

   (g) How a grinding wheel is selected?

2. (a) Explain clearly the geometry of chips and economics of machining.

   (b) Make a note on indexing and selection of milling machine.

3. (a) Explain the signature of tool angles on metal cutting.

   (b) Sketch a capstan lathe and explain its working.

4. (a) Explain a vertical milling machine working with the help of a sketch.

   (b) Explain lapping operation in detail.

5. Explain the working of ECM; EBM and WJM with applications

   (a) Discuss the merits and demerits of AJM process.

   (b) Explain clearly the influence of temperature in metal cutting.

7. (a) Sketch and explain the planer mechanism and mention its advantages.

   (b) Explain the various operations performed on

8. Explain honing and super finishing; electro polishing and buffing.

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[2546/1/I/13]

[03 – 2206]

1I/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2013
MECHANICAL ENGINEERING
MANUFACTURING TECHNOLOGY – II

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART - A

1. a) What is milling centre?

b) List the factors that affect tool life

c) Differentiate turret and capstan lathes.

d) At what speed a 20 mm drill will run for cutting a sheet at 30 m /min surface speed.

e) Give the advantages of broaching machine.

f) Classify and list shapers.

g) Differentiate between grain and grade of a grinding wheel.

PART - B

2. a) Explain the procedure of alignment tests on pillar type drilling machines.

b) Make a note on ECM and USM.

3. a) Explain how EBM process is carried out? What are thelimitations?

b) How a grinding wheel is selected? Outline the various factors that influence its selection.

4. Describe a lathe with a neat sketch indicating the different operations can be carried out on it.

5. Explain theory of Lee and staffer; chip formations and Honning.

6. a) List out the differences between Shaper and Planer.

b) Describe the principal parts of a twist drill with a neat sketch.

7. Explain the working principle of AJM and LBM processes with their applications, advantages and disadvantages.

8. a) Compare plain and universal milling machines,

b) Explain polishing and buffing.

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[155/12/12]

[03 - 2203]

II/IV B.E. DEGREE EXAMINATION.

SECOND SEMESTER - APRIL 2013
MECHANICAL ENGINEERING
ENGINEERING MECHANICS — II

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Define spring constant. What are its units?
   (b) What is an impulse?
   (c) Explain D' Alembert's principle in rectilinear motion.
   (d) Define a compound pendulum.
   (e) What is a gyroscope?
   (f) What is meant by instantaneous centre?
   (g) What is mass moment of inertia? Give its value for a circular disc.

PART B

2. A particle moves along a straight line with an acceleration described by the equation $\alpha - {}^{8}/_{s^2}$ where 'α' is in m/s^2 and ***s*** in m. When ***t = l s, s*** = 4 m and ***u*** = 2 m/ s. Determine acceleration when ***t*** = 2 s.
3. The frequency of free vibrations of a weight ***W*** with a spring constant ' ***K'*** is 12 cycles/second, when an extra weight of 20 N is coupled with the weight ***W,*** the frequency reduces to 10 cycles/second. Find the weight ***W*** and stiffness ' ***K*** ' of the spring.
4. Two bodies of weight 10 N and 1.5 N are connected to the two ends of a light inextensible string passing over a smooth pulley. The weight 10 N is placed on a rough horizontal surface while the weight of 1.5 N is hanging vertically in air. Initially, the friction between the weight 10 N and the table is just sufficient to prevent motion. If an additional weight of 0.5 N is added to the w'eight 1.5 N, determine, (a) the acceleration of the two weights (b) the tension in the string after adding the additional weight. Take £-9.80 m/s2.
5. A projectile is projected with a velocity of 20 m/s in air at angle ***a*** 1 with the horizontal. The ***x*** and ' ***y'*** coordinates of a point lying on the trajectory of the particle with respect to point of projection are 20 m and 8 m respectively. Find the angle of projection of the particle.
6. A flywheel of mass 5000 kg having a radius of gyration 1 m looses its speed from 400 rpm to 280 rpm in 2 minutes. Calculate
   (a) Retarding torque acting on it
   (b) Change in kinetic energy during the above period
   (c) Change in its angular momentum.
7. A sphere of radius ***'r'*** and mass ***'m'*** is released from rest on a rough inclined plane whose inclination to the horizontal is 30. Find the minimum value of the coefficient of friction compatible will rolling motion.
8. A train of loaded trucks weighs 200 kN and is pulled up an incline 500 m long with a gradient of 1 in 40 by a wire rope wound round the drum of a winding engine at the top of the incline. The frictional resistance is 10 N per kN. The drum weights 30 kN, its diameter is 2 meter and its radius of gyration is 1 m. If the tension is the rope must not exceed 12.5 kN and if the speed of the train is not to exceed 50 km/hr, find the minimum time in which the train can be hauled up the incline and the maximum power required.

[03 - 2207]

II/IV B.E. DEGREE EXAMINATION
SECOND SEMESTER - APRIL 2013
MECHANICAL ENGINEERING
MATERIAL SCIENCE AND METALLURGY

Time: 3 hours Max. Marks: 70

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART - A

1. a) List the types of crystal defects.
   b) What is phase rule?
   c) Show the **[111]** direction in a cubic lattice.
   d) Name the crystal structure of cu and cd.
   e) Give the importance of heat treatment process.
   f) Indicate the benefits of nondestructive testing of materials.
   g) What do you understand by annealing?
2. List out the various types of nondestructive testing of materials and explain any two of them.
3. Distinguish between the direction of the dislocation line, the Burger's vector and the direction of motion for both edge and screw dislocations differentiating between positive and negative types.
4. Explain carburizing, cyaniding and surface hardening of steels.
5. Discuss the various types of alloying elements introduced in steel to make it heat resistant. How do they alter the original properties?
6. a) Discuss the mechanism of creep and fatigue.
   b) Name some applications of copper alloys and describe why that alloy is used for the practical applications.
7. Give the composition, properties and uses of stainless steel, tool steel and manganese steel.
8. a) Classify composite materials and indicate their applications,
   b) Discuss the uses and limitations of plain carbon steels.

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[185/02/13]

[03 -2205]

MV B.E. DEGREE EXAMINATION

SECOND SEMESTER - APRIL 2013

MECHANICAL ENGINEERING

INDUSTRIAL ELECTRONICS AND MICROPROCESSORS

Time: 4 hours Max. Marks : 70

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART – A

1. a) Draw the circuit diagram of a Half-wave Rectifier and give the expression for the ripple factor.

   b) Write down the applications of an NPN Transistor.

   c) Draw the input and output characteristics of a CE transistor and indicate different regions.

   d) Explain the basic operation of AND and NAND gates with the aid of truth tables.

   e) What are the applications of induction heating? Explain.

   f) Convert 401910) into Hexadecimal number.

   g) How does a J-K flip-flop differ from an S-R flip-flop in its basic operation?

PART - B

2. a) Draw the circuit diagram of Wein-bridge oscillator and explain the complete operation with necessary- steps.

   b) Briefly explain the operation of Zener diode and mention its applications.

3. a) Discuss the operation of the following circuits with neat sketches:

      i) SCR

      ii) Full-wave rectifier

   b) Explain the comparison between Bridge rectifier and two diode full wave rectifier.

4. Discuss the following with relevant sketches:

   i) Open loop and closed loop control systems

   ii) Motor speed control and voltage control

   iii) Implementation of D Flip-Flop from a J-K flip-flop

5. a) Explain the salient features of DeMorgan's theorem.

   b) Using the Boolean algebra simplify the following Boolean expressions:

      i) $Z = \overline{\overline{AB + AC}} + \overline{\overline{ABC}}$

      ii) $Z = \overline{(\bar{A} + C).(B + \bar{D})}$

6. a) Explain the operation of clocked D flip-flop with the help of neat sketches.

   b) Discuss the operation of clocked J-K flip-flop with the help of truth table.

7. a) (i) Explain the necessary steps involved in Hexadecimal-to- Decimal conversion system.

      ii) Convert the hexadecimal number 2A6(l6)to its equh alent decimal number.

b) Briefly explain the following:

i) ROM

ii) PROM

iii) RAM

8. a) Explain briefly, how a J-K flip-flop can be used for parallel data transfer.

b) List the steps involved to initiate and implement the 8085 interrupts.

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[155/02/12]

[03 – 2204]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

MATHEMATICS IV

Time : Three hours Maximum : 70 marks

Answer Part A and any FOUR questions from Part B & All questions carry equal marks.

Part A must be answered at one place and assume any missing data.

PART A

1. (a) Is the function $|z|$ analytic? Justify your answer.

(b) Evaluate $\int_C \frac{z^2-z+1}{z-1}$ dz where C is the circle $|z|$ =1.

(c) Find the residue of $\frac{ze^z}{(z-1)^3}$ at its pole.

(d) What do you mean by test of significance?

(e) What is Null Hypothesis?

(f) Find the z-transform of n^2

(g) Solve the differential equation $u_{n+1} - 2u_n + 2u_{n-1} = 0$

PART-B

2. (a) Consider the function

$$f(z) = \begin{cases} xy^2\,(x+iy) + (x^2+y^4), z \neq 0 \\ 0 \qquad\qquad z = 0 \end{cases}$$

Are the Cauchy-Reimann equations satisfied by f at the origin? Is f analytic at z=0? Justify your claim.

(b) Find analytic function f(z) = u(r,θ) + iv(r, θ) such that u(r, θ) = r^2 cos2θ-rcosθ+2.

3. (a) State and prove Cauchy's integral formula.

(b) Show that under the transformation $w=\frac{1}{z}$ maps a circle into a circle.

4. (a) Find the nature and location of the singularities of $f(z) = \frac{1}{z(z-2)(z-3)^3(z+5)^2}$

(b) Using the calculus of residues, show that $\int_0^{2\pi} \frac{d\theta}{(5-3cos\theta)^2} = \frac{5\pi}{32}$.

5. (a) 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?

(b) A research worker wishes to estimate mean of a population by using sufficiently large sample. The probability is 95% that sample mean will not differ from the true mean by more than 25% of S.D. How large a sample should be taken?

6. (a) Write and discuss the properties of *t*-distribution.

(b) Fit a poisson distribution to the following data and test for its goodness of fit at level of significance 0.05

x	0	1	2	3	4
y	419	352	154	56	19

7. (a) solve the differential equation

$y_{n-2} - 6\, y_{n+1} + 8\, y_n = 2^n + 6n$

(b) Find the response of the system

$y_{n+2} - 5\, y_{n+1} + 6\, y_{n-1}$ with $y_0 = 0$, $y_1 = 1$ by z-transform method.

8. Using the inversion integral method, find the inverse z-transform of $\frac{10z}{(z-1)(z-2)}$

(b) Given the $Z(u_n) = \frac{2z^2+3z+4}{(z-3)^3}$; $|z| > 3$ find the values of u_1, u_2, u_3.

[03 – 2204]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

ELECTRICAL TECHNOLOGY

Time : Three hours Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. a) State and explain Faraday's laws of electromagnetic induction.
   b) Draw the load characteristics of DC series, shunt generators.
   c) What is Swinburne's Test? Mention its advantages.
   d) Draw the equivalent circuit of single phase transformer.
   e) Write the expression for maximum, staring torque of an induction motor.
   f) What is power factor? What is its range? Classify the loads according to power factor.
   g) What is megger? Draw the equivalent circuit

2. a) Define the terms magnetic field strength, magnetic potential and flux density. Write necessary expressions.
   b) A coil of resistance 100Ω is placed in a magnetic field of 1Wb. The coil has 100 turns and a galvanometer of 400Ω resistance is connected in series with it. Find the average emf and the current if the coil is moved in $1/10^{th}$ second from the given field of 0.2 mWb
3. a) Explain the principle of DC generator.
   b) Write about losses in DC generator and derive expression for efficiency of DC generator

4. a) List out different types of DC motors.
   b) Derive the expression for torque developed in a DC motor.

5. a) What is voltage regulation in transformer?
   b) Explain open-circuit test of a single phase transformer.

6. a) Classify the induction motor with reference to rotor construction.
   b) The power input to the rotor of 440V, 50Hz,6-pole,3 phase induction motor is 80kW. The rotor electromotive force is deserved to make 100 complete alternation per minute calculate i) the slip ii) the rotor speed iii) rotor copper loss per phase

7. a) Explain the working principle of alternator? How it depends on the excitation, load current and power factors?
   b) Why synchronous motor are self staring? Explain

8. a) Explain the construction and working of induction type energy meter.
   b) Write about different types of Ameters.

[03 – 2211]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

ELECTRICAL TECHNOLOGY

Time : Three hours Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. a) What are the components in a magnetic circuit?
   b) Distinguish between statistically and dynamically induced emfs
   c) Draw the configuration of long shunt differentially compounded generator.
   d) What are the advantages of Swinburne's test?
   e) Draw the current locus diagram of a R – C series circuit.
   f) What is the use of open circuit test on 1 – ϕ transformer?
   g) List out the methods available for starting of synchronous motor.

2. a) Explain the hysteresis characteristics of a magnetic materials.
   b) A current carrying conductor is situated at right angles to a uniform magnetic field have a flux density of 0.3 wb/m^2. Calculate the force per meter length of the conductor when the current is 200 A

3. a) What are the requirements to be satisfied for emf generation?
   b) The magnetic flux through a coil of 500 turns increases uniformly for 200 to 300 μwb in 0.2 sec. Determine the average value of the induced voltage.

4. a) Explain open circuit characteristics of a D.C shunt generators.
   b) An 8 pole wave connected armature has 300 conductors and runs at 400 rpm. Determine the useful per polo if the emf on open circuit is 500V.

5. a) Explain the useful feature of back emf in a D.C motor.
   b) A 500V DC motor takes an armature current of 60A when its speed is 800 rpm. If armature resistance is 0.2 Ω. Calculate the torque produced in Newton-metres.

6. a) Explain how the regulation of a 1-ϕtransformer can be obtained from O.C and S.C test results.
   b) In a 50KVA transformer the iron losses are 500W and the full load copper loss is 800W. Find the efficiency at full load and half full load at unity p.f.

7. a) Explain the power stages in an Induction motor.
   b) A 6- pole Induction motor is fed from 50 Hz supply. If the frequency of rotor e.m.f at full load is 2 Hz. Find full load slip and speed.

8. a) Derive emf equation of an alternator.
   b) Explain the working of:
      i) Megger
      ii) Energy meter

[03 – 2205]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

ENVIRONMENTAL STUDIES

Time : Three hours Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.
   a) What are environmental indicators?
   b) What is meant by food web?
   c) Define Ex-situ and In-situ conservation .
   d) What are alternate energy resources?
   e) What is cloud seeding ?
   f) What is ecological pyramid?
   g) What is eutrophication?
2.
   a) Give the scope and importance of environmental studies.
   b) Write about the components of an ecosystem.
3.
   a) Give in brief various types of forests in India.
   b) State briefly the importance of forests.
4.
   a) Give an account of the water resoureces and the effects of their over exploitation.
   b) Explain the effects of mining activities on the environment.
5.
   a) Explain about the various threats to Biodiversity.
   b) Write about the efforts for Bio diversity conservation in India.
6.
   a) Give an account of the causes , sources and effects of air pollution on man and vegetation.
   b) Write about the methods for control of air pollution.
7.
   a) Give a critical account of the impact of population growth on environment.
   b) Write about the environmental ethics ; issues and possible solutions.
8. Write short notes on:
   a) Environmental legislations.
   b) Noise pollutions
   c) Nuclear hazards.

[03 – 2206]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY-II

Time : Three hours Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.
   a) What are different types of chips?
   b) Explain thhe assumptions made in development of merchant's circle diagram.
   c) Disccuss the parameters to be considered in USM .
   d) What is mechanism of metal cutting ?
   e) What is indexing?
   f) Which types of jobs are produced on planner?
   g) Write any four uses of electrochemical machining.

2.
   a) Derive the equation for of merchant force circle.
   b) During a metal cutting test, under orthogonal conditions it was found that cutting force is 1100N and feed force is 700N when cutting at 165m/min.The angle of rake is 10^o and shearplane angle is found to be at 19^o. Determine
      i. Shearing velocity
      ii. Chip flow velocity
      iii. Work done per minute in shearing the metal and work done against friction

3.
   a) Briefly explain the Jig Boring machine.
   b) Briefly explain the different operations performed on lathe.

4.
   a) What are the different types of taper turning attachments?
   b) Explain different types of indexing methods? Any two of them with example.

5.
   a) What is the manufacturing of grinding wheel?
   b) Explain specifications of grinding wheel.

6.
   a) Discuss the advantages and limitations of Abrasive Jet machining
   b) Describe about the principle of chemical grinding and electrochemical grinding machine.

7.
   a) What do you understand by different gear finishing processes?
   b) Differentiate between capston and turret lathe.

8.
   a) Explain briefly precision grinding operations.
   b) Describe about the factors that influence the quality in LBM and ECM processes.

[03 – 2207]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

MATERIAL SCIENCE AND METULLURGY

Time : Three hours Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. Write short notes on the following:
   a) Crystal system
   b) vacancy
   c) Gibbs rule
   d) Tool steel
   e) Nimonic
   f) Isothermal transformation
   g) Visual inspection
2.
   a) Discuss the crystal structures of common metallic materials.
   b) Discuss the mechanisms of plastic deformation.
3.
   a) What are the invariant reactions?Give examples.
   b) Draw the Iron – Iron carbide diagram and label it.
4.
   a) Explain annealing and normalising treatments of steel
   b) Discuss carburizing process in detail with examples.
5.
   a) Explain brittle and ductile fractures.
   b) Explain mechanisms of creep .
6.
   a) Give the classifications of composite materials with examples and applications.
   b) Explain about the fibre- reinforced composites.
7.
   a) Explain basic principle, operations, equipment and applications of magnetic method.
   b) Explain liquid penetration test method in detail.
8.
   a) What are the main advantages of powder metallurgy process and its application?
   b) Explain the various types of aluminium alloys and their uses.

[03 – 2210]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

MATERIAL SCIENCE AND METULLURGY

Time : Three hours Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.
   a) Define space lattice and defect.
   b) Show that packing efficiency of an FCC crystal is 0.74.
   c) How many types of crystal systems are possible?
   d) Distinguish between unit cell and primitive cell.
   e) What is transition temperature?
   f) Explain and why amorphous materials solidify once a range of temperatures but crystalline materials exhibit sharp freezing points.
2.
   a) Explain , why edge dislocations move more easily than screw dislocations.
   b) Discuss various types of defects in crystals.
3. Draw neatly the Iron-Iron carbide diagram and label all the points,lines, temperatures and reactions associated with it.
4.
   a) Discuss various chemical methods of surface hardening treatments.
   b) Discuss the martempering treatment and their applications.
5.
   a) Discuss in detail about isothermal transformation curves.
   b) Differentiate between hardness and hardenability.
   c) Differentiate between carburizing and cyaniding.
6. Discuss about the following :
   a) Cast Irons
   b) Tool steels
   c) Copper alloys.
7.
   a) Explain about creep curve.
   b) What is critical resolved shear stress?
   c) Differentiate between slip and twinning.
   d) Explain about fatigue curve.
8. Write short notes on :
   a) Metal matrix composites.
   b) Fabrication methods of composites.
   c) Applications of composites.

[03 – 2212]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

THEORY OF MACHINES - I

Time : Three hours Maximum : 70 marks

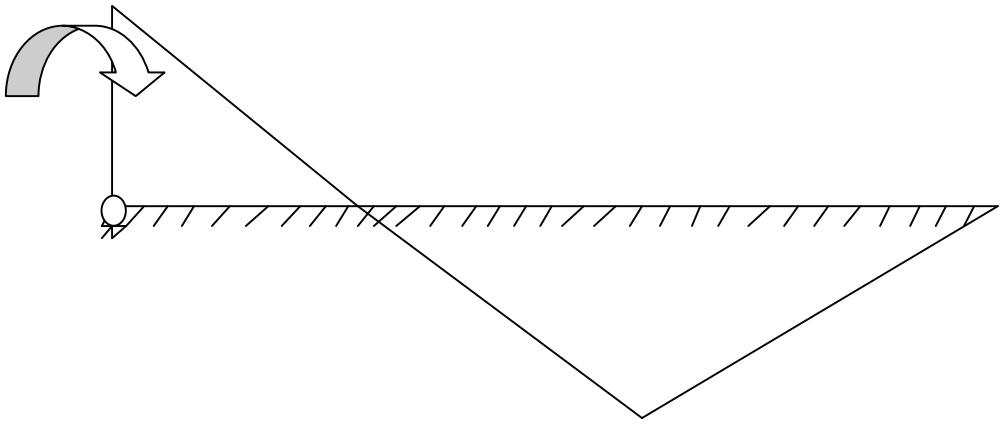
Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1. a) What is degrees of freedom of a mechanism? How is it determined?
   b) Explain Kennedy's theorem?
   c) What is instantaneous centre of rotation?
   d) What is Coriollis accerelation component?
   e) What is a Hooke's joint ? Where is it used ?
   f) Explain Hunting of governors?
   g) What is meant by piston effort and crank effort ?

2. a) How are quick return mechanism and crank and slotted lever mechanism are different from each other?
   b) In a slider – crank mechanism, the stroke of the slider is one – half the length f the connecting rod. Draw a diagram to give the velocity of the slider at any instant assuming the crankshaft to turn uniformly.

3. a) The length of the links of a four-bar chain shown in figure are AB = 3m, BC = 9m , CD = 6 m and DA = 10.5m. The link AD is fixed and the link AB turns with uniform angular velocity. When angle BAD = 90^o and B and C are on opposite sides of AD, find the position of point E on BC which at the instant is accelerated along BC.



4. a) What is a pantograph ? Explain it with a neat sketch.

b) A hooke's joint connects two shafts whose axes interest at 25^o. What will be the angle turned by the driving shaft when
i) the velocity ratio is maximum, minimum and unity,
ii) the acceleration of the driven shaft is maximum and minimum.

5. Determine the axial force required to engage a cone clutch transmitting 25kW of power at 750 rpm. Average friction diameter of the cone is 400 mm and average pressure intensity $60KN/m^2$. Semi-cone angle 10^o and coefficient of friction 0.25. Also find the width of the friction cone.

6. a) What do you mean by dynamic equivalent system? Explain.
b) The length of the connecting rod of a gas engine is 500 mm and its centre of gravity lies at 165 mm from the crank pin centre . The rod has a mass of 80kg and a radius of gyration of 182mm about an axis through the centre of mass. The stroke of piston is 225mm and the crank speed is 300 rpm. Determine the inertia force on the crankshaft when the crank has turned 30^o from the inner dead centre.

7. A porter governor has equal arms. Each arm is 240mm long and is pivoted on the axis of rotation. Each ball has a mass of 5kg and the load on the sleeve is 18kg. The ball radius is 150mm when the sleeve begins to rise and 200 mm at the maximum speed. Find the range of speed. Also determine the coefficient of insenstiveness if the friction at the sleeve is equivalent to a force of 10N.

8. Explain the following:
a) Sensitiveness, hunting and stability relating to governors.
b) Inertia force in reciprocating engines by Graphical method.

[03 – 2213]

II/IV B.E. DEGREE EXAMINATION

SECOND SEMESTER – APRIL 2014

MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY-II

Time : Three hours Maximum : 70 marks

Answer Part 1 and any FOUR questions from Part B & All questions carry equal marks.

Question 1 must be answered at one place and assume any missing data.

1.
   a) Define ISO system of tool signature.
   b) How are cutting forces of a tool measured?
   c) What are the operations which can be performed using a planar?
   d) How is a milling machine is specified?
   e) Define rake angle in a drill?
   f) Classify grinding wheels.
   g) How is inter electrode gap maintained in ECG ?
2.
   a) What are the forces acting on a single point tool as it is engaged to cut ?
   b) What are the various forms of wear found in cutting tools?
   c) What is the use of chip breakers?
3.
   a) What are the differences between the automatic lathe and capstan lathe?
   b) Under what conditions planning operation would be performed over other machining processes like milling , broaching ,shaping?
   c) How do you specify a slotter machine?
4.
   a) What type of hole results if the lips of twist drill are of unequal length?
   b) What is the advantage of using a drill jig for mass production?
   c) What is broaching? What are its advantages?
5.
   a) What are the common materials for milling cutters ?
   b) Explain the construction of a dividing head giving the applications for which it can be used.
   c) Describe the functions of a knee, column and saddle in a milling machine?
6.
   a) What are disk grinders?
   b) What is meant by standard marking of grinding wheels?
   c) Describe the various types and kind of abrasives?
7.
   a) Explain the principle of operation of EBM ?what are its applications?
   b) What is water jet machining (WJM)?explain its applications.
8. Write short notes on the following:
   a) Lapping
   b) Turning centre.
   c) Grinding force