

G 1850

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Automobile Engineering/Mechanical Engineering

AU 010 404/ME 010 404—MANUFACTURING PROCESS (AU, ME)

(Regular—2010 Admissions)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. How are dissolved gases removed from molten metal ?
2. What is ductility and how is it measured ?
3. Why is flux not needed in gas-tungsten arc welding ?
4. List the defects commonly observed after flat rolling.
5. What is the difference between fullering, edging and blocking ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Why is the quality of submerged arc welding very good ? Explain.
7. Describe the features of a fusion weld and identify the different regions.
8. What is wave soldering ?
9. What factors contributes to spreading in flat rolling ?
10. Explain the features of a typical forging die.

(5 × 5 = 25 marks)

Part C

Answer all questions.

Each full question carries 12 marks.

11. Define Shrinkage and Porosity. How can you tell whether cavities in a casting are due to porosity or shrinkage ?

Or

12. What are the major defects that can occur during casting process ? Explain the reasons for these defects.

Turn over

13. The fatigue failure generally occur in the heat affected zones of welds instead of through the weld bead itself. Discuss the reasons.

Or

14. What determines whether a certain welding process can be used for work pieces in horizontal, in vertical or in up side down positions ? Explain with appropriate examples.
15. An annealed copper strip, 9 in (228 mm) wide and 1.00 in (25 mm) thick is rolled to a thickness of 0.80 in (20 mm) in one pass. The roll radius is 12 in (300 mm) and the rolls rotate at 100 rpm. Calculate the roll force and the power required in this operation.

Or

16. What are the advantages of thread rolling ? Explain the features of thread rolling process with suitable sketches.
17. What are the advantages of isothermal forging ? Explain the features of an impression die and closed die forging processes.

Or

18. How can you tell whether a certain part is forged or cast ? Explain the features that you would investigate.
19. Describe the features of a Forming Limit Diagram (FLD).

Or

20. What is the difference between punching and blanking ? Explain how sheet metal forming differs from rolling, forging and extrusion.

(5 × 12 = 60 marks)

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Automobile Engineering/Mechanical Engineering/Production Engineering
AU 010 406/ME 010 406/PE 010 406—ELECTRICAL TECHNOLOGY (AU, ME, PE)
(Regular—2010 Admissions)

Time : Three Hours

Maximum : 100 Marks

Part A

*Answer all questions.
Each question carries 3 marks.*

1. Define the terms Pole-Pitch and Coil span.
2. What are the various losses occurring in a D.C. generator ?
3. What is $p-n$ junction ? Discuss the formation of depletion layer in $p-n$ junction.
4. What is a Thyristor ? How has this name been coined ?
5. Define turn-on and turn-off times for an SCR.

(5 × 3 = 15 marks)

Part B

*Answer all questions.
Each question carries 5 marks.*

6. Explain any *five* major causes for which the generator may fail to excite.
7. Explain what happened when a D.C. motor is connected across an A.C. supply.
8. What are the possible causes of excessive sparking at brushes in a d.c. motor ?
9. Explain the condition for maximum efficiency of a transformer.
10. Explain the forward bias and reverse bias on the depletion layer in a $p-n$ junction.

(5 × 5 = 25 marks)

Part C

*Answer all questions.
Each full question carries 12 marks.*

11. A shunt generator delivers 195 at terminal p.d. of 250 V. The armature resistance and shunt field resistance are 0.02Ω and 50Ω respectively. The iron and friction losses equal to 950 W. Find :
 - (a) EMF generated.
 - (b) Cu losses.
 - (c) Output of the prime motor.
 - (d) Commercial, mechanical and electrical efficiencies.

Or

12. Write a brief note about the Hysteresis losses and Eddy current losses in a D.C. generator.

Turn over

13. What are the characteristics of a three phase transformer ? Briefly explain how change in frequency affects the operation of a given transformer.
Or
14. Describe the different tests used to analyze the performance of a Transformer.
15. What are the factors affecting the size of an alternator ? Discuss the constructional details and working of an alternator with suitable sketches.
Or
16. Discuss the procedure for starting a synchronous motor. Give a brief comparison between synchronous and induction motors.
17. What are the advantages of electric drives ? Explain individual and group drives with examples.
Or
18. Explain the factors affecting the choice of a motor for an industrial application. What type of motor will you suggest for a textile mill ?
19. Describe the structural features of power diodes. Explain how these differ from signal diodes.
Or
20. Can a forward voltage be applied to an SCR soon after its anode current has fallen to zero ? Explain.

A forward voltage is applied to an SCR soon after reverse recovery current drops nearly to zero value. Discuss what would happen to SCR.

(5 × 12 = 60 marks)

11. A shunt generator delivers 150 A at terminal p.d. of 250 V. The armature resistance and shunt field resistance are 0.02 Ω and 50 Ω respectively. The iron and friction losses equal to 500 W. Find
(a) EMF generated
(b) Cu losses
(c) Output of the prime motor
(d) Commercial, mechanical and electrical efficiencies
Or
12. Write a brief note about the Hysteresis losses and Eddy current losses in a D.C. generator.

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(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Mechanical and Automobile Engineering

MACHINE TOOLS (M, U)

(Improvement/Supplementary—2004 admission onwards)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 4 marks.

1. What are the advantages of the method of taper turning using an attachment ?
2. How is a drilling machine specified ?
3. Give the comparison of shaper and planer.
4. What is indexing in a milling operation ?
5. What is surface grinding ?
6. What is gear hobbing ?
7. What do you mean by NC tooling ?
8. What is a copying machine ?
9. What are the uses of building a simulation model of a manufacturing process ?
10. Explain unmanned machining.

(10 × 4 = 40 marks)

Part B

Each question carries 12 marks.

11. (a) Explain the terms cutting speed, feed, depth of cut and metal removal rate in a lathe operation.
(b) What are advantages of automation ?

(8 + 4 = 12 marks)

Or

12. (a) Differentiate between a turret lathe and a centre lathe.
(b) Explain countersinking and counterboring operation.

(5 + 7 = 12 marks)

13. With a sketch, explain how the quick return motion is accomplished in a hydraulic shaper.

Or

14. With a sketch, explain the main elements of a broaching tool. How are broaching machines classified ?

Turn over

15. Explain (i) the methods of evaluation of surface finish ; (ii) Gear form cutters.

Or

16. Explain the different gear finishing operations.

17. (a) What are the classifications of NC machine tools ?

(b) With a sketch, explain the Swiss type automatic screw machine.

(3 + 9 = 12 marks)

Or

18. (a) Briefly describe the components of a CNC machine.

(b) Explain the features of semiautomatic multitool centre lathe.

(5 + 7 = 12 marks)

19. Write notes on (i) Management of tool room ; (ii) Cellular manufacturing.

(12 marks)

Or

20. (a) What are the components of a flexible manufacturing system ?

(b) Write notes on the manufacture of printed circuit boards.

(6 + 6 = 12 marks)

[5 × 12 = 60 marks]

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Mechanical Engineering

HYDRAULIC MACHINES (M)

(Improvement/Supplementary--2004 Admission onwards)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 4 marks.

1. What is jet propulsion ? How do the ships move with this principle ?
2. Distinguish between momentum equation and impulse momentum equation.
3. Distinguish between impulse and reaction turbines.
4. How does the speed of a turbine get regulated ?
5. What do you mean by the NPSH of a pump ? What is its significance ?
6. With a neat sketch explain the working of a centrifugal pump.
7. What are the functions of air vessels in a reciprocating pump ?
8. What limits the suction lift of a reciprocating pump ?
9. With a neat sketch explain the working of vane pump.
10. Show any four hydraulic symbols used in the hydraulic circuits.

(10 × 4 = 40 marks)

Part B

Answer all questions.

Each question carries 12 marks.

11. A circular water jet having a cross-sectional area of 30cm^2 moves with a velocity of 40m/s and strikes tangentially a curved plate. The angle of curvature of plate at outlet is 120° with the X-direction. Assuming the plate to be frictionless, find the force exerted by the jet on the plate in X-direction :
 - (a) When the plate is stationary. (6 marks)
 - (b) When the plate is moving in the direction of jet with the velocity of 10m/s . (6 marks)

Or

Turn over

12. Using Buckingham's Pi-theorem show that the velocity through an orifice is given by :

$$V = \sqrt{2gH} f\left(\frac{D}{H}, \frac{\mu}{\rho V H}, \frac{\sigma}{\rho V^2 H}\right)$$

where H is the head causing flow, D is the diameter of the orifice, μ is the coefficient of viscosity, ρ is the mass density, σ is the surface tension and g is the gravitational acceleration.

(12 marks)

13. With neat sketches explain working of a Kaplan Turbine. What are its construction features ?

(12 marks)

Or

14. A pelton wheel is required to develop 6 MW when working under a head of 300 m. It rotates with a speed of 550 rpm. Assuming jet ratio as 10 and overall efficiency as 85%, calculate : (i) diameter of wheel (ii) quantity of water required and (iii) number of jets. Assume suitable values for the velocity coefficient and speed ratio.

(12 marks)

15. (a) Classify hydraulic pumps.

(6 marks)

- (b) Derive the Euler head equation for a centrifugal pump.

(6 marks)

Or

16. A 4-stage centrifugal pump supplying water is to be designed for a total lift of 120 m when running at 1450 rpm ; its discharge under these conditions is 0.24 m³/s, The vanes are set back at an angle of 30° with the tangent to the wheel at outlet, and the impeller is surrounded by guide vanes. The water enters the vane passages in a radial direction, the velocity of flow through the impeller is 0.3 of the outlet peripheral velocity and the losses in the pump amount to one-third of the velocity head at discharge from the impeller. Find the diameter and width of impeller at outlet, the manometric efficiency and the angle of the guide vanes.

(12 marks)

17. With neat sketches explain the effect of acceleration on indicator diagram in the case of a reciprocating pump.

(12 marks)

Or

18. (a) Suggest some methods to smoothen or even-out the pulsating discharge from a reciprocating pump.

(6 marks)

- (b) A single acting reciprocating pump has the plunger diameter of 20 cm and stroke of 30 cm. The pump discharges 0.53 m³ of water per minute at 60 rpm. Find the theoretical discharge, coefficient of discharge, and percentage slip of pump. Further, if suction and delivery heads are 4 m and 12 m respectively, work out power required to run the pump.

(6 marks)

19. What is meant by a positive displacement pump ? Explain any three types of the positive displacement pumps.

(12 marks)

Or

20. Explain with neat sketch the working of (i) Hydraulic crane and (ii) Hydraulic lift. (12 marks)

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, MAY 2012**Fourth Semester**

Branch : Mechanical Engineering

THEORY OF MACHINES—I (M)

(Improvement/Supplementary—2004 admission onwards)

Time : Three Hours

Maximum : 100 Marks

Part A

*Answer all questions.
Each question carries 4 marks.*

1. How are the kinematic pairs classified ?
2. What do you mean by instantaneous centre in a mechanism ?
3. What is kinematic synthesis of mechanism ?
4. What do you mean by precision points in the synthesis of mechanisms ?
5. What is a straight line mechanism ?
6. Write a note on Hooke's joint.
7. Describe a torsion dynamometer.
8. What is a cone clutch ?
9. What are the different forms of gear tooth ?
10. Explain the law of gearing.

(10 × 4 = 40 marks)

Part B*Each question carries 12 marks.*

11. With sketches, explain (i) Whitworth quick return mechanism ; (ii) Elliptical trammel.
Or
12. The crank of a slider crank mechanism is 15 cm. and the connecting rod is 60 cm. long. The crank makes 360 r.p.m. in the clockwise direction. When it has turned 45° from the inner dead centre position, determine :
 - (i) Acceleration of the midpoint of the connecting rod.
 - (ii) Average acceleration of the connecting rod.
13. Determine the lengths of all the four links in a four bar chain for which the length of the smallest being 10 cm., to generate $y = \log_{10} x$ in the interval $1 \leq x \leq 10$ for three accuracy points. The range of angle of input link and output link are $45^\circ \leq \theta \leq 105^\circ$, and $135^\circ \leq \phi \leq 225^\circ$.
Or
14. Explain the graphical method of synthesis of a slider crank mechanism.

Turn over

15. With sketches, explain any two exact straight line mechanisms.

Or

16. With sketch, explain the Davis steering gear mechanism.

17. A simple band brake is applied to a rotating drum of diameter 500 mm. The angle of lap of the band on the drum is 270° . One end of the band is attached to a fulcrum pin of the lever and other end is to a pin 100 mm. from the fulcrum. If the coefficient of friction is 0.30 and a braking force of 100 N is applied at a distance of 600 mm. from the fulcrum, find the braking torque when the drum rotates in the (i) anti-clockwise direction and (ii) clockwise direction.

Or

18. With a sketch, explain the internal expanding shoe brake and derive the expression for the braking torque.

19. Derive the expression for the minimum number of teeth on the pinion in order to avoid interference between two mating involute gears.

Or

20. Two mating involute spur gears have 28 and 45 teeth and a standard addendum of one module. Find the length of path of contact and length of arc of contact in terms of module when pressure angle is 20° .

(5 × 12 = 60 marks)

G 1372

(Pages : 3)

Reg. No.....ME.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

ENGINEERING MATHEMATICS—III

(Common to all Branches)

[Improvement/Supplementary/2004 Admissions onwards]

Time : Three Hours

Maximum : 100 Marks

Answer one full question from each module.

Each full question carries 20 marks.

Use of Statistical tables is permitted.

Module I

1. (a) Find the general solution of $p^2 + 2py \cot x = y^2$. (5 marks)

(b) Solve $xdx - xdy + \log xdx = 0$. (5 marks)

(c) Find the orthogonal trajectory of the cardioids

$$r = a(1 - \cos\theta).$$

(10 marks)

Or

(d) Solve $(D^2 + 2D + 1)y = 2 + x^2$. (5 marks)

(e) Solve $(D^2 - 2D + 1)y = e^x \log x$ by the method of variation of parameters. (5 marks)

(f) A bullet enters a board of 0.1 m thickness with a velocity of 200 m/s, pierces it and leaves the board with a velocity of 80 m/s. Assuming that the resistance offered by the board to the bullet is proportional to the square of its velocity, find the time taken by the bullet to pierce the board. (10 marks)

Module 2

2. (a) Solve $(pq - p - q)(z - px - qy) = pq$. (5 marks)

(b) Solve by Charpit's method : $q + xp = p^2$. (8 marks)

(c) Solve $\frac{\partial^2 z}{\partial x^2} - 7\frac{\partial^2 z}{\partial x \partial y} + 12\frac{\partial^2 z}{\partial y^2} = e^{x-y}$. (7 marks)

Or

Turn over

(d) Find the complete solution of

$$\frac{\partial^2 z}{\partial x^2} - 3 \frac{\partial^2 z}{\partial x \partial y} + 2 \frac{\partial^2 z}{\partial y^2} = e^{(2x-3y)} + \sin(x-2y).$$

(10 marks)

(e) A bar with insulated sides is initially at temperature 0°C throughout. The end $x = 0$ is kept at 0°C and heat is suddenly applied at the end $x = l$ so that $\frac{\partial u}{\partial x} = A$ for $x = l$, where A is a constant. Find the temperature function $u(x, t)$.

(10 marks)

Module 3

3. (a) Using Fourier integrals, show that

$$\int_0^\infty \frac{\lambda \sin \lambda x}{k^2 + \lambda^2} d\lambda = \frac{\pi}{2} e^{-kx}, \quad x > 0, k > 0$$

(8 marks)

(b) Solve the integral equation $\int_0^\infty F(x) \cos px dx = \begin{cases} 1-p & 0 \leq p \leq 1 \\ 0 & p > 1 \end{cases}$ and hence deduce that

$$\int_0^\infty \frac{\sin t}{t^2} dt = \frac{\pi}{2}.$$

(12 marks)

Or

(c) Using Parseval's identity, show that $\int_0^\infty \frac{dx}{(1+x^2)^2} = \frac{\pi}{4}$.

(10 marks)

(d) Find the Fourier cosine transform of $f(x) = \frac{1}{(1+x^2)}$ and hence derive Fourier sine transform

$$\text{of } \phi(x) = \frac{x}{1+x^2}.$$

(10 marks)

Module 4

4. (a) In 800 families with 5 children each, how many families would be expected to have (i) 3 boys and 2 girls; (ii) 2 boys and 3 girls; (iii) no girl; (iv) at the most two girls? Assume probabilities for boys and girls to be equal.

(12 marks)

(b) Suppose a book of 585 pages contains 43 typographical errors. If these errors are randomly distributed throughout the book, what is the probability that 10 pages, selected at random, will be free from errors?

(8 marks)

Or

(c) The probability that a man aged 40 years will die before reaching the age of 45 years is 0.018. Out of a group of 400 men, now aged 40 years, what is the probability that 2 men will die within the next 5 years?

(10 marks)

(d) Fit a normal curve to the following distribution:

x :	2	4	6	8	10
f :	1	4	6	4	1

(10 marks)

Module 5

5. (a) In a simple sample of 600 men from a certain city, 400 are found smokers. In one of 900 men from another city, 450 are found to smoke. Do the data indicate that the cities are significantly different with respect to the prevalence of smoking among men?

(10 marks)

(b) Tests for breaking strength were carried out on two lots of 5 and 9 steel wires respectively. The variance of first lot was 250 and that of the second was 482. Is there a significant difference in their variability?

(10 marks)

Or

(c) Obtain the equation of the normal curve that may be fitted to the data and test the goodness of fit:

x :	4	6	8	10	12	14	16	18	20	22	24	Total
$f(x)$:	1	7	15	22	35	43	38	20	13	5	1	200

(10 marks)

(b) What is the probability that a correlation coefficient of 0.75 or less can arise in a sample of 30 from a normal population in which the true correlation coefficient is 0.9?

(10 marks)

[5 × 20 = 100 marks].

G 1403

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Mechanical Engineering

MACHINE DRAWING—II (M)

(Improvement/Supplementary—2004 Admissions onwards)

Time : Four Hours

Maximum : 100 Marks

1. Details of a Screw Jack are shown on (accompanying Fig. 1 on page 2) Assemble the parts and draw the following views :
 - (a) Elevation, right half in section. (25 marks)
 - (b) Plan (15 marks)
2. Details of a feed Check Valve are shown on (accompanying Fig. 2 on page 3) Assemble the parts and draw the following views :
 - (a) Elevation, right half in section. (40 marks)
 - (b) Top View. (20 marks)

Turn over

G 1412

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Mechanical Engineering/ Automobile Engineering

ELECTRICAL TECHNOLOGY (M, U)

(Improvement/Supplementary—2004 Admissions onwards)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 4 marks.

1. Is the equivalent copper loss referred to the high voltage side the same as the equivalent copper loss referred to the low voltage side? Explain.
2. If the speed of a motor is increased, what effect does this have on (a) the counter emf; (b) the armature current? Give reasons.
3. Under what conditions of load is it possible for an alternator to have a voltage regulation of zero percent?
4. Explain why the rotor speed is essentially a function of stator synchronous speed and slip?
5. What are the important features of various braking methods of dc motors?
6. Why the traction drive should have large torque at low speeds and when just being started?
7. What is an oscillator? State the conditions for oscillation?
8. List any four distinct applications of CRO?
9. What are the normal methods of turn-on of an SCR?
10. What is meant by breakover voltage of an SCR? Why is it necessary to keep supply voltage much less than breakover voltage?

(10 × 4 = 40 marks)

Part B

Answer either section (a) or (b) from each module.

Each full question carries 12 marks.

Module 1

11. (a) The corrected instrument readings obtained from open and short-circuit tests on 10 kVA, 450/120V, 50 Hz transformer are :

OC test :

$V_1 = 120V$, $I_1 = 4.2A$, $W_1 = 80 W$, V_2 , W_2 and I_2 were read on the low voltage side.

Turn over

S.C. test :

$V_1 = 9.65V$, $I_1 = 22.2A$, $W_1 = 120 W$ with low voltage winding short circuited.

Compute :

- (i) The equivalent circuit constants and draw the same.
 (ii) Efficiency and voltage regulation for 80% lagging pf load.

(12 marks)

Or

- (b) A 250 V shunt motor with an armature resistance of 0.5Ω and a shunt field resistance of 250Ω drives a load the torque of which remains constant. The motor draws from the supply a line current of 21 A when the speed is 600 rpm. If the speed is to be raised to 800 rpm, what change must be effected in the shunt field resistance? Assume that the magnetization curve of the motor is a straight line?

(12 marks)

Module 2

12. (a) A 3-phase star connected alternator on open circuit is required to generate a line voltage of 3.4 kV, 50Hz when driven at 500 rpm. The stator has 3 slots per pole per phase and 10 conductors per slot. The coils are short chorded by 1 slot. Calculate (i) the number of poles and (ii) the useful flux per pole.

(12 marks)

Or

- (b) (i) Explain the torque-slip characteristics of a 3 phase induction motor. (4 marks)
 (ii) A 440V, 3 phase 50Hz slip ring induction motor runs at 960 rpm on full load with a rotor current of 35A. Allowing 250 watts for the copper loss and 1kW for mechanical loss, find the resistance per phase of 3 phase rotor winding.

(8 marks)

Module 3

- 13 (a) Explain the motors and drives used in (i) textile mill ; (2) mine ; (3) hoists ; (4) crane.

(12 marks)

Or

- (b) (i) State and explain the issues which should be examined to decide the suitability of regenerative braking for a given traction application.

(8 marks)

- (ii) Why diesel electric traction is preferred to electric traction?

(4 marks)

Module 4

- 14 (a) Draw the circuit of a RC phase shift oscillator and explain how sustained oscillations are produced in it.

(12 marks)

Or

- (b) With a neat block diagram, explain the functioning of a CRO. Describe the working of each electrode in the CRT.

(12 marks)

Module 5

- 15 (a) With a neat circuit diagram, explain the controlled rectification using SCR. With necessary waveforms, show how the firing angle is controlled.

(12 marks)

Or

- (b) With a block schematic, describe the resistance welding scheme and the functions of the different timers in it.

(12 marks)

[5 × 12 = 60 marks]

MODULE 5

19. Two independent sample sizes of 7 and 6 has the following values :

Sample A	:	28	30	32	33	31	29	34
Sample B	:	29	30	30	24	27	28	—

Examine whether the samples have been drawn from normal populations having the same variance.

(12 marks)

Or

20. Records taken of the number of male and female births in 800 families having four children are as follows :

No. of male births	:	0	1	2	3	4
No. of female births	:	4	3	2	1	0
No. of families	:	32	178	290	236	94

Test whether the data are consistent with the hypothesis that the binomial law holds and the

chance of male birth is equal to that of the female birth, namely, $p = q = \frac{1}{2}$.

(12 marks)

[5 × 12 = 60 marks]

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

EN 010 401—ENGINEERING MATHEMATICS—III

(Regular—2010 Admissions)

[Common to all Branches]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. Expand $\pi x - x^2$ in a half range sine series in the interval $(0, \pi)$ upto the first three terms.

2. Find the Fourier Transform of $f(x) = \begin{cases} 1 & \text{for } |x| < 1 \\ 0 & \text{for } |x| > 1. \end{cases}$

3. Form the partial differential equation by eliminating the arbitrary functions from

$$f(x + y + z, x^2 + y^2 + z^2) = 0.$$

4. During war, one ship out of nine was sunk on an average in a certain voyage. What was the probability that exactly 3 out of a convoy of 6 ships would arrive safely ?

5. A random sample of 900 members has a mean 3.4 cm. Check if it can be reasonably regarded as a sample from a large population of mean 3.2 cm. and SD = 2.3 cm.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Obtain Fourier series for the function

$$f(x) = \pi x, \quad 0 \leq x \leq 1$$

$$= \pi(2 - x) \quad 1 \leq x \leq 2$$

7. Find the Fourier cosine transform of $f(x) = \frac{1}{1+x^2}$ and hence derive Fourier sine Transform of

$$\phi(x) = \frac{x}{1+x^2}$$

Turn over

8. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$, given that $\frac{\partial z}{\partial y} = -2 \sin y$, when $x = 0$ and $z = 0$, when y is an odd multiple of $\frac{\pi}{2}$.

9. Assume that the probability of an individual coal-miner being killed in a mine accident during an year is $\frac{1}{2400}$. Use Poisson's distribution to calculate the probability that in a mine employing 200 miners, there will be at least one fatal accident in a year.

10. A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased.

(5 × 5 = 25 marks)

Part C

Answer any one full question from each module.
Each full question carries 12 marks.

MODULE 1

11. If $f(x) = x$, $0 < x < \pi/2$
 $= \pi - x$, $\pi/2 < x < \pi$, show that

$$(a) f(x) = \frac{4}{\pi} \left[\sin x - \frac{\sin 3x}{3^2} + \frac{\sin 5x}{5^2} - \dots \right] \quad (5 \text{ marks})$$

$$(b) f(x) = \frac{\pi}{4} - \frac{2}{\pi} \left[\frac{\cos 2x}{1^2} + \frac{\cos 6x}{3^2} + \frac{\cos 10x}{5^2} + \dots \right] \quad (7 \text{ marks})$$

Or

12. Obtain the first three coefficients in the Fourier Cosine series for y from the following data :

$x : 0 \ 1 \ 2 \ 3 \ 4 \ 5$

$y : 4 \ 8 \ 15 \ 7 \ 6 \ 2$

(12 marks)

MODULE 2

13. (a) Using Fourier integral representation, show that $\int_0^{\infty} \frac{\cos \omega x}{1 + \omega^2} d\omega = \frac{\pi}{2} e^{-x}$ ($x \geq 0$). (6 marks)

(b) Solve for $F(x)$ the integral equation $\int_0^{\infty} F(x) \sin tx \, dx = \begin{cases} 1, & 0 \leq t < 1 \\ 2, & 1 \leq t < 2 \\ 0, & t \geq 2. \end{cases}$ (6 marks)

14. (a) Using Parseval's identity, prove that $\int_0^{\infty} \frac{dt}{(a^2 + t^2)(b^2 + t^2)} = \frac{\pi}{2ab(a+b)}$. (5 marks)

(b) Solve the integral equation $\int_0^{\infty} F(x) \cos px = dx \begin{cases} 1-p, & 0 \leq p \leq 1 \\ 0, & p > 1 \end{cases}$ and hence deduce that

$$\int_0^{\infty} \frac{\sin^2 t}{t^2} dt = \frac{\pi}{2}.$$

(7 marks)

MODULE 3

15. Solve $2zx - px^2 - 2pxy + pq = 0$.

(12 marks)

Or

16. Solve :

$$(a) (D^2 - 2DD' + D'^2)z = e^{(2x+3y)}. \quad (6 \text{ marks})$$

$$(b) \frac{\partial^2 z}{\partial x^2} + 3 \frac{\partial^2 z}{\partial x \partial y} + 2 \frac{\partial^2 z}{\partial y^2} = 12xy. \quad (6 \text{ marks})$$

MODULE 4

17. A random variable X has the following probability distribution values of X :

$x :$	0	1	2	3	4	5	6	7	8	9
$p(x) :$	a	$3a$	$5a$	$7a$	$9a$	$11a$	$13a$	$15a$	$17a$	$19a$

(3 marks)

(a) Determine the value of a

(6 marks)

(b) Find $P(X < 3)$, $P(X \geq 3)$, $P(2 \leq X < 5)$.

(3 marks)

(c) What is the smallest value for which $P(X \leq x) > 0.5$?

Or

18. A sample of 100 button cells tested to find the length of life, produced the following results :
 $\bar{x} = 12$ hours, $\sigma = 3$ hours. Assuming the data to be normally distributed, what percentage of button cells are expected to have life

(a) more than 15 hours ;

(4 marks)

(b) less than 6 hours ; and

(4 marks)

(c) between 10 and 14 hours ?

(4 marks)

Turn over

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(Pages : 3)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Mechanical Engineering / Production Engineering
ME 010 403 / PE 010 403—HYDRAULIC MACHINES (ME, PE)

(Regular—2010 Admissions)

Time : Three Hours

Maximum : 100 Marks

*Answer all questions.
Each question carries 3 marks.*

Part A

1. Distinguish between impulse and reaction turbines.
2. What are Propeller Pumps ?
3. Define run away Speed of Turbines.
4. Briefly explain the Principle of Similitude.
5. List the applications of vane pumps.

(5 × 3 = 15 marks)

Part B

*Answer all questions.
Each question carries 5 marks.*

6. Differentiate between force exerted by a fluid jet on a single curved moving plate and a series of curved moving plates.
7. How speed of a turbine is regulated ? Explain.
8. Write a note on selection of pumps from performance curves. Explain this using a chart.
9. Discuss the application of collapse of bubble theory to hydraulic machines.
10. With neat sketch, explain a self priming pump. List the advantages during its operation.

(5 × 5 = 25 marks)

Part C

*Answer all questions.
Each full question carries 12 marks.*

11. A jet of water of 30 mm. diameter, moving with a velocity of 15 m/s, strikes a hinged square plate of weight 245.25 N at the centre of the plate. The plate is of uniform thickness. Find the angle through which the plate will swing.

(12 marks)

Or

Turn over

12. A jet propelled boat, moving with a velocity of 5 m/s, draws water - amid ship. The water is discharged through two jets provided at the back of the ship. The diameter of each jet is 150 mm. The total resistance offered to the motion of the boat is 4905 N. Determine :—

- Volume of water drawn by the pump per second, and
- Efficiency of the jet propulsions.

(12 marks)

13. A Water turbine has a velocity of 6 m/s. at the entrance to the draft tube and a velocity of 1.2 m/s. at the exit. For friction losses of 0.1 m. and a tail water 5 m. below the entrance to the draft tube, find the pressure head at the entrance.

(12 marks)

Or

14. A Pelton turbine develops 3000 kW under a head of 300 m. The overall efficiency of the turbine is 83 %. If speed ratio = 0.46, $C_r = 0.98$ and Specific speed is 16.5, then find :

- Diameter of the turbine and
- Diameter of the jet.

(12 marks)

15. Explain the principle of working of a centrifugal pump. The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm. and 60 cm. respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m.

(12 marks)

Or

16. What are multistage pumps? Discuss the various pump performance characteristics and selection of pumps from performance curves.

(12 marks)

17. The pressure difference ' ΔP ' in a pipe of diameter ' D ' and length ' L ' due to turbulent flow depends upon the velocity ' V ' viscosity ' μ ', density ' ρ ' and roughness ' K '. Using Buckingham's π - theorem, obtain an expression for ' ΔP '

(12 marks)

Or

18. The pressure drop in an aeroplane model of size $\frac{1}{10}$ of its prototype is 80 N / cm². The model is tested in water. Find the corresponding pressure drop in the prototypes. Take density of air = 1.24 kg/m³. The viscosity of water of 0.01 poise while the viscosity of air is 0.00018 poise.

(12 marks)

19. Derive an expression for the head lost due to friction in the delivery pipe of a reciprocating pump with and without an air vessel. (12 marks)

Or

20. Explain, with neat sketches :—

- Slurry pump.
- Hydraulic ram.
- Hydraulic press.

Derive expressions for efficiencies in each case.

(12 marks)

[5 × 12 = 60 marks]

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(Pages : 3)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2012

Fourth Semester

Branch : Automobile Engineering / Mechanical Engineering / Production Engineering

AU 010 405 / ME 010 405 / PE 010 405—MACHINE DRAWING (AU, ME, PE)

(Regular—2010 Admissions)

Time : Three Hours

Maximum : 100 Marks

Drawing sheets are to be supplied.

Answer all the questions.

Missing dimensions, if any may be assumed.

Drawing sheets will be supplied.

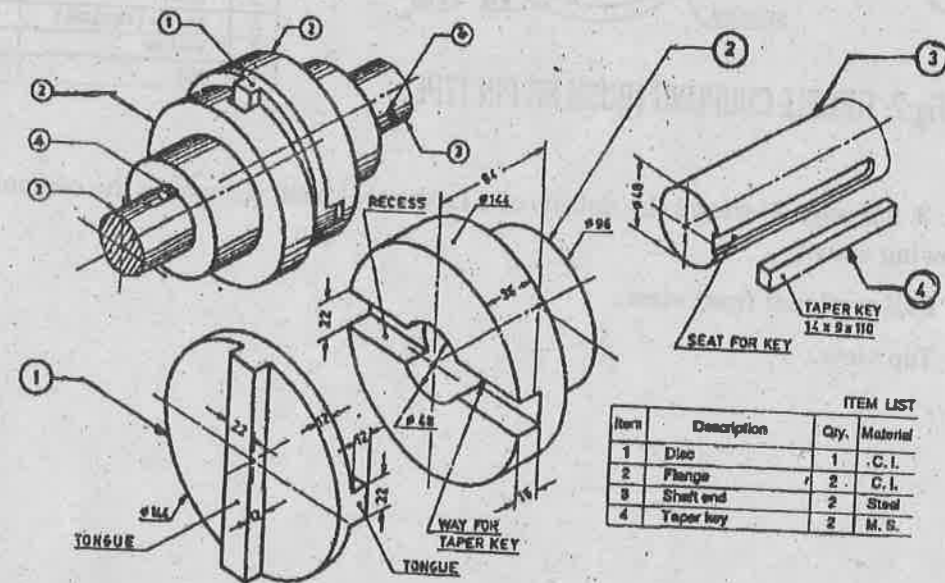
- I. (a) Show by sketches the different methods of indicating an actual surface roughness values of 1.6 microns.
- (b) What are the different types of surfaces ? Illustrate with sketches.

(10 marks)

II. Answer (a) or (b) :

(a) An Oldham's Coupling is shown in Fig. 1. Draw to a suitable scale :

- (i) The Elevation with top half in section.
- (ii) End view.



ITEM LIST			
Item	Description	Qty.	Material
1	Disc	1	C.I.
2	Flange	2	C.I.
3	Shaft end	2	Steel
4	Taper key	2	M.S.

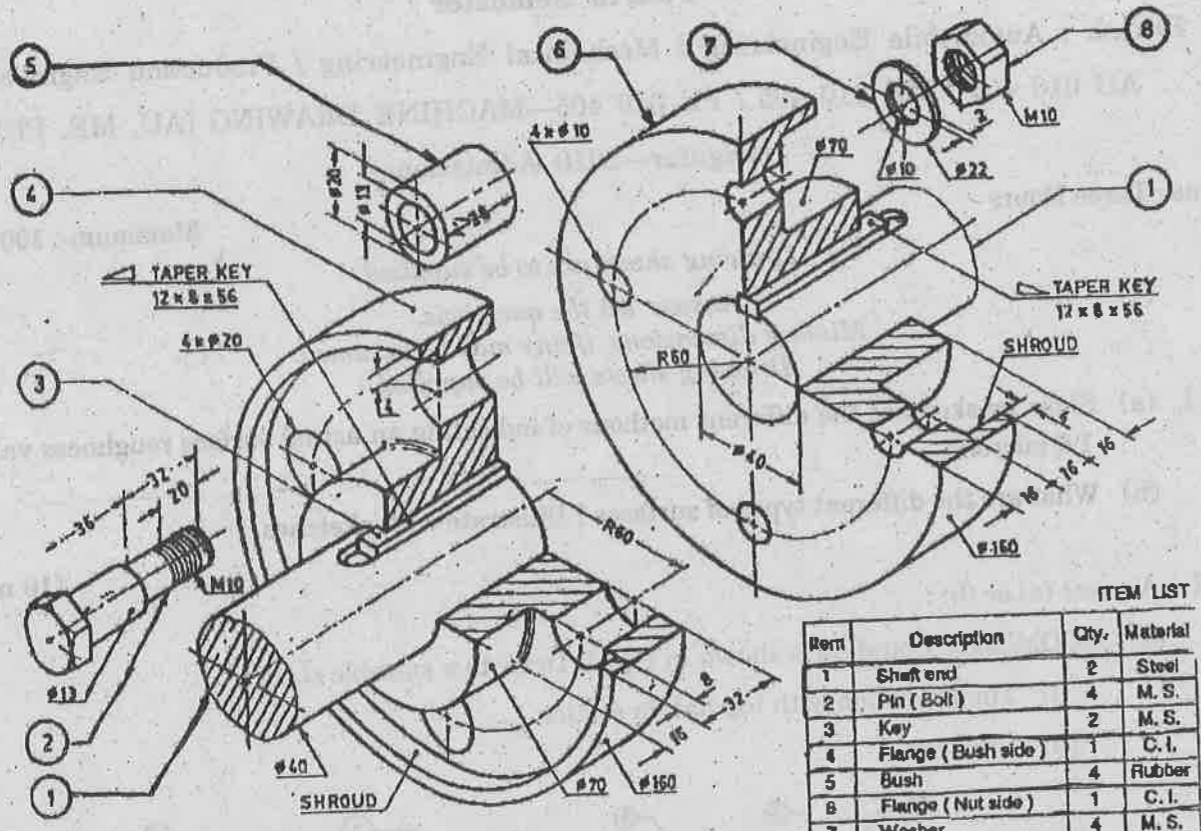
Fig 1: OLDHAM'S COUPLING

Or

(30 marks)
Turn over

II. (b) A Flexible coupling (Bush or Pin type) is shown in Fig. 2. Draw to a suitable scale :

- (i) The Elevation with top half in section.
- (ii) End view.



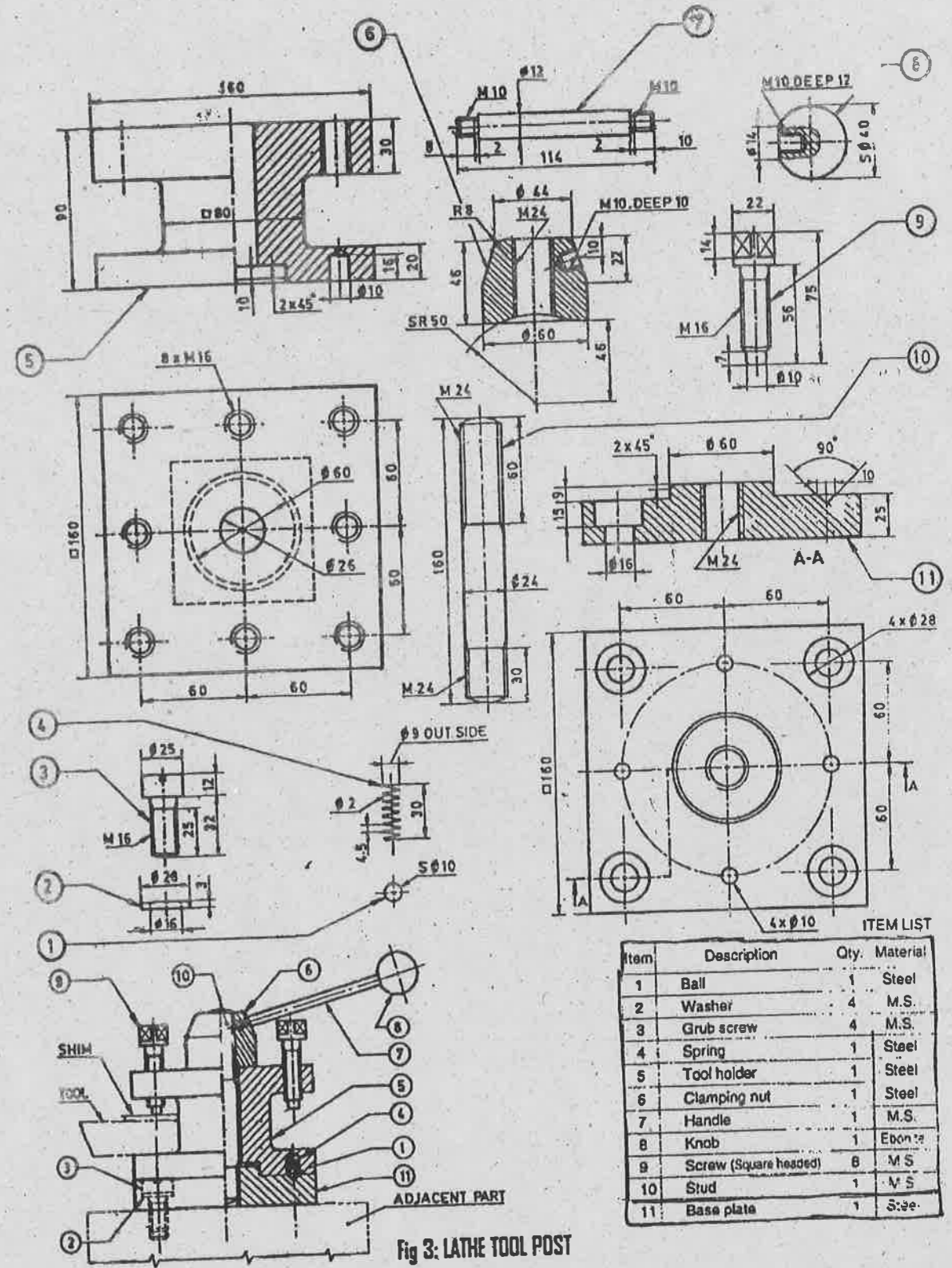
Item	Description	Qty.	Material
1	Shaft end	2	Steel
2	Pin (Bolt)	4	M. S.
3	Key	2	M. S.
4	Flange (Bush side)	1	C. I.
5	Bush	4	Rubber
6	Flange (Nut side)	1	C. I.
7	Washer	4	M. S.
8	Nut	4	M. S.

Fig 2: FLEXIBLE COUPLING (BUSH OR PIN TYPE)

(30 marks)

III. The Fig. 3. (on page 3) shows the details of a Lathe tool post. Assemble the components and draw the following views :

- (a) Full sectional front view. (40 marks)
- (b) Top view. (20 marks)



Item	Description	Qty.	Material
1	Ball	1	Steel
2	Washer	4	M.S.
3	Grub screw	4	M.S.
4	Spring	1	Steel
5	Tool holder	1	Steel
6	Clamping nut	1	Steel
7	Handle	1	M.S.
8	Knob	1	Ebonite
9	Screw (Square headed)	8	M.S.
10	Stud	1	M.S.
11	Base plate	1	Steel

Fig 3: LATHE TOOL POST